

Eighth Annual Report

COMMISSION OF CONSERVATION

CANADA

1917

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Commission of Conservation

*Constituted under "The Conservation Act," 8-9 Edward VII, Chap. 27, 1909, and
amending Acts, 9-10 Edward VII, Chap. 42, 1910, and 3-4 George V.,
Chap. 12, 1913.*

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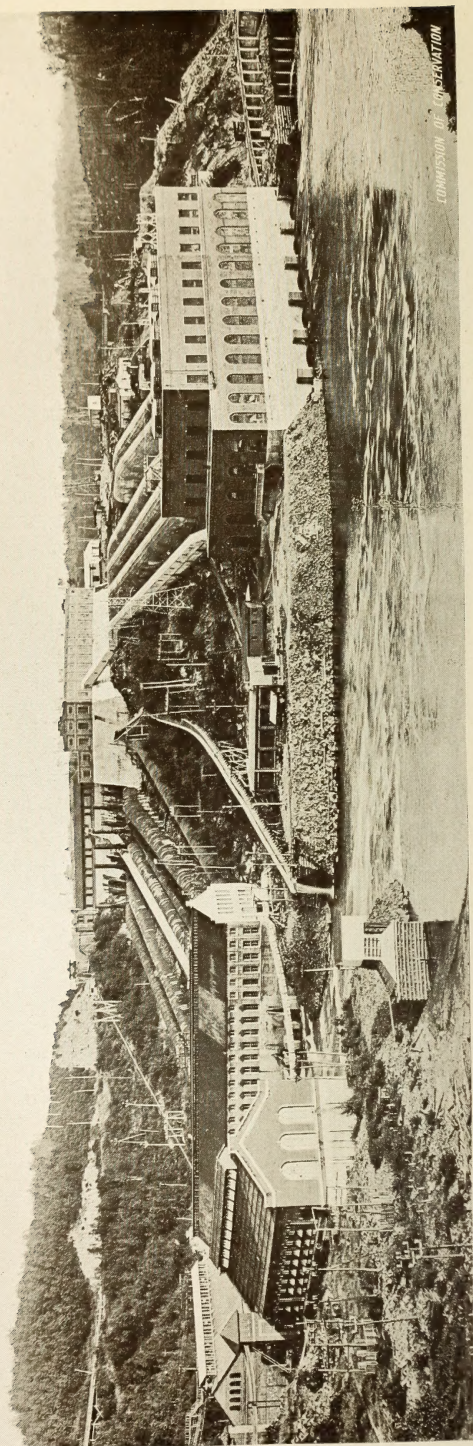
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DR. HENRY M. TORY, President, University of Alberta, Edmonton, Alta.
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HON. WILLIAM J. ROCHE, Minister of the Interior, Ottawa.
Minister of Mines, Ottawa.
HON. AUBIN E. ARSENAULT, Premier, Prince Edward Island
HON. ORLANDO T. DANIELS, Attorney-General, Nova Scotia
HON. E. A. SMITH, Minister of Lands and Mines, New Brunswick
HON. JULES ALLARD, Minister of Lands and Forests, Quebec
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HON. ARTHUR L. SIFTON, Premier, Minister of Railways and Telephones,
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HON. T. D. PATTULLO, Minister of Lands, British Columbia

Assistant to Chairman, Deputy Head:

MR. JAMES WHITE



HYDRO-ELECTRIC POWER DEVELOPMENT AT SHAWINIGAN FALLS, QUE.
Two hundred thousand horse-power developed, half of which is used locally, mostly for electro-chemical purposes.

Commission of Conservation

Canada

SIR CLIFFORD SIFTON, K.C.M.G., Chairman
JAMES WHITE, Assistant to Chairman, Deputy Head

REPORT
OF
THE EIGHTH
ANNUAL MEETING

HELD AT OTTAWA

JANUARY 16-17

1917



Committees of the Commission of Conservation, 1917

Committee on Fisheries, Game and Fur-Bearing Animals

Dr. C. C. Jones, *Chairman*; Hon. A. E. Arsenault, Mr. J. P. Babcock, Hon. O. T. Daniels, Hon. G. H. Ferguson, Hon. Walter E. Foster, Hon. A. B. Hudson, Dr. Howard Murray, Hon. T. D. Pattullo, Dr. J. W. Robertson, Hon. E. A. Smith.

Committee on Forests

Senator W. C. Edwards, *Chairman*; Dr. Frank D. Adams, Mr. J. P. Babcock, Dr. B. E. Fernow, Hon. William J. Roche, Mr. W. B. Snowball, and the ex-officio Members of the Commission who represent the various Provinces.

Committee on Lands

Dr. J. W. Robertson, *Chairman*; Dr. Frank D. Adams, Dr. George Bryce, Hon. Martin Burrell, Mgr. C. P. Choquette, Mr. E. Gohier, Dr. C. C. Jones, Dr. W. J. Rutherford, Dr. H. M. Tory, and the ex-officio Members of the Commission who represent the various Provinces.

Committee on Minerals

Dr. Frank D. Adams, *Chairman*; Mr. J. P. Babcock, Mgr. C. P. Choquette, Mr. J. F. MacKay, Dr. Howard Murray, Hon. E. L. Patenaude, and the ex-officio Members of the Commission who represent the various Provinces.

Committee on Press and Co-operating Organizations

Mr. J. F. MacKay, *Chairman*; Hon. Jules Allard, Mr. J. P. Babcock, Dr. George Bryce, Dr. Howard Murray, Dr. H. M. Tory.

Committee on Public Health

Sir Edmund B. Osler, *Chairman*; Hon. H. S. Béland, Hon. G. W. Brown, Hon. Martin Burrell, Mgr. Choquette, Dr. C. C. Jones, Dr. W. J. Rutherford.

Committee on Waters and Water-Powers

Hon. H. S. Béland, *Chairman*; Dr. Frank D. Adams, Hon. Jules Allard, Hon. G. H. Ferguson, Dr. B. E. Fernow, Hon. Walter E. Foster, Mr. C. A. McCool, *Acting Chairman*; Hon. T. D. Pattullo, Hon. E. A. Smith.

TO HIS EXCELLENCY VICTOR CHRISTIAN WILLIAM, DUKE OF DEVONSHIRE, MARQUIS OF HARTINGTON, EARL OF DEVONSHIRE, EARL OF BURLINGTON, BARON CAVENDISH OF HARDWICKE, BARON CAVENDISH OF KEIGHLEY, K.G., P.C., G.C.M.G., G.C.V.O., ETC., ETC., GOVERNOR GENERAL OF CANADA.

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the Eighth Annual Report of the Commission of Conservation for the fiscal year ending March 31st, 1917.

Respectfully submitted

CLIFFORD SIFTON

Chairman

OTTAWA, April 3, 1917.

OTTAWA, April 2, 1917

SIR:

I have the honour to transmit herewith the Eighth Annual Report of the Commission of Conservation. This contains a report of the proceedings of the Eighth Annual Meeting, held in Ottawa on January 16-17, 1917, in which is included summary statements of the work done under the several Committees of the Commission, during the fiscal year ending March 31, 1917.

I have the honour to be, Sir

Your obedient servant

JAMES WHITE

Assistant to Chairman

SIR CLIFFORD SIFTON, K.C.M.G.

Chairman

Commission of Conservation.

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INTRODUCTION

THE eighth annual meeting of the Commission of Conservation, the proceedings of which comprise the present volume, was held under circumstances of exceptional significance in respect to the importance of the Commission's labours. In his annual address the Chairman, Sir Clifford Sifton, drew attention to the manner in which the necessity for conservation, for national efficiency, has been impressed by the war upon all peoples, belligerent or neutral: "Among the most remarkable results of the war has been the re-examination which each nation has been compelled to make with regard to its material resources. The gospel which we have been preaching for some years past has now been found to be the true gospel. It has been found by hard experience that national safety demands that nations should not only possess resources but understand them and be able to utilize them economically. Whereas, a few years ago people listened to the discussion of this subject with polite but somewhat academic interest, they now know that no subject is of more importance to the national welfare, and that the lack of developed capacity to utilize every possible resource may, in certain emergencies, mean disaster." While great advances have been achieved in Canada during recent years toward investigation and proper utilization of the natural resources of the Dominion, it has, nevertheless, become steadily more apparent, as the work of the Commission of Conservation has progressed, that the magnitude of the economic problems awaiting solution demand unremitting study and practical effort.

ORIGIN: The Commission of Conservation, which is charged specifically with the promotion of national efficiency, was created in 1909, in response to a widespread demand for a saner system of national economy with respect to the administration and development of the public domain. The United States had previously entered upon a national conservation policy, and when President Roosevelt, in recognition of the international problems involved, invited Canada, Newfoundland and Mexico to participate in a North American Conservation Conference at Washington, the Hon. Clifford Sifton, Hon. Sydney Fisher and Dr. Henri S. Béland were delegated to represent the Dominion. The conference adopted a declaration of principles, including a recommendation that a permanent Conservation Commission be established by each country represented. In pursuance of this recommendation, the Parliament of Canada unanimously enacted a law, assented to on May 19th,

1909, providing for the creation of such a body. By order-in-council, under date of September 3rd of the same year, the members of the Commission, 20 in number, were duly appointed, and the Hon. Clifford Sifton was named as Chairman.

CONSTITUTION: The membership of the Commission is honorary and non-partisan in character. The *ex-officio* members include the Federal Ministers of the Interior, of Agriculture and of Mines and the member of each provincial government who is charged with the administration of the natural resources of such province. In addition to the *ex-officio* members, twenty commissioners are appointed by the Governor in Council to hold office during pleasure; at least one appointed member from each province must be a member of the faculty of a university within the province. Not only is the personnel of the Commission truly representative of the entire Dominion, but Parliament legislated with the further object of ensuring in its membership a high degree of scholarship, of scientific knowledge and of administrative experience.

In function and status the Commission is purely advisory. While dependent financially upon an annual appropriation from the Federal Parliament, it forms no portion of the ordinary governmental administration and possesses neither executive nor administrative powers. It is authorized solely to study, investigate and advise; the effectiveness of its work depends upon the merits of its recommendations, which must, therefore, be based upon accurate and complete information. Referring, in his inaugural speech, to the exceptional character of the Commission, the Chairman defined its status as follows: "In a sentence, the Commission is a body constituted for the purpose of collecting exact information, deliberating upon, digesting and assimilating this information so as to render it of practical benefit to the country and for the purpose of advising upon all questions of policy that may arise in reference to the actual administration of natural resources where the question of their effective conservation and economical use is concerned."

ORGANIZATION AND WORK: Broadly speaking, the efforts of the Commission have been directed mainly toward:

(1) Making an inventory of Canada's natural resources

(2) Moulding public opinion and advising administrative authorities regarding their more intelligent management. The different branches of work have been prosecuted under the direction of seven committees, dealing, respectively, with Lands, Forests, Waters and Water Powers, Minerals, Fisheries, Game and Fur-bearing Animals, Public Health and Press and Co-operating Organizations.

In the autumn of 1914 a special branch was organized in connection with the town planning work. As a result of field investigations, by a staff of technical experts, substantial progress has been made in the task of national stocktaking and toward the solution of many administrative problems.

Committee on Lands: The Committee on Lands, recognizing that successful agriculture is the greatest factor in Canada's progress and prosperity, and that soil fertility can be permanently retained only through the practise of scientific agriculture, has been engaged chiefly in the promotion of improved farming methods. To ensure the development of the committee's activities in accordance with the most pressing requirements, a diagnosis of actual farming conditions in Canada was first undertaken. In 1910 and succeeding years, agricultural surveys were conducted in representative farming sections in the various provinces. Reliable data were secured respecting practically every phase of farm operations, particularly with regard to such matters as systematic rotation of crops, seed selection, control of insect pests and plant diseases, the supply and efficiency of labour, the use of manures and fertilizers, comparative yields over a term of years, the care of wood-lots and the availability of fuel and water supplies. On the whole, the results indicated that the introduction of improved farming methods would double the output of Canada's field crops within a period of twenty years, exclusive of the increased production from additional acreage placed under cultivation.

To supplement the survey work and to correct the unsatisfactory conditions which it revealed, constructive measures were undertaken in 1912. Illustration farms were established in each of the districts visited for survey purposes to demonstrate practically the benefits derived from more scientific methods. This work proved very successful, especially in its educative effect upon the farmers in the communities surrounding the illustration farms. The work on these farms was supervised by the Committee on Lands for two years, when, the objects of the Commission in initiating it having been fully achieved, the system was transferred to the Federal Department of Agriculture which is now carrying it on on a much larger scale.

The Committee is now undertaking survey and illustration work of a more intensive character in Dundas county, Ont., to be extended over a considerable period of time and to embrace practically every phase of agricultural production, including rural, social and economic organizations. The report of the first year's work in this area appears in the present volume.

In addition to the foregoing activities, the Committee has conducted a series of experiments to determine the conditions under which alfalfa may be successfully grown in the province of Quebec. Constant attention has also been devoted to educational effort, reports and bulletins have been widely distributed and an active propaganda for better farming has been conducted at numerous meetings of farmers clubs, societies, etc., throughout the Dominion.

Committee on Forests: Through both federal and provincial executive authorities the Committee on Forests has, since its inception, been instrumental in promoting a national forestry policy calculated to remedy past errors and to avoid future errors in the protection, utilization and perpetuation of Canada's forest wealth.

In the past the amount of timber uselessly destroyed by fire has been many times as great as that utilized. Great quantities of timber have also been wasted through ignorance of practicable means and methods of utilization. Not only has the amount of standing timber been reduced to a fraction of what it might be had proper precautions been taken in the past, but the quality of Canadian forests has unquestionably deteriorated through the partial failure of governmental administrative agencies to require the adoption of adequate technical measures calculated to preserve the forest as such and to increase its productivity.

This partial failure has been largely due to the lack of an adequate number of technically trained practical men in the several governmental organizations charged with the administration of Crown timber lands, both Dominion and provincial. As a consequence, relatively little scientific research work has been done, as yet, to lay the foundation for a Canadian forestry policy along broad and permanent lines. The forest should be treated as a crop, which may be reproduced time after time on the same soil with increasing productiveness. To only a limited extent, however, has this conception been translated into actual practice on the ground. The influence of the Commission has been exerted consistently in the direction of securing a change in these points of view, and material progress has been achieved, though much still remains to be accomplished.

The primary problem has been to check the enormous waste from forest fires. The measures advocated in this connection include adequate appropriations for fire protection work, thorough overhead supervision and inspection of fire-ranging staffs, the selection of fire-rangers on the basis of merit, and the regulation of settlers' slash-burning operations under the permit system. The organization of additional co-operative fire-protective associations

has been urged, and representations have been made in favour of the collection of complete forest fire statistics by all governmental agencies concerned in order that the loss from this source from year to year may be accurately determined.

Largely through the initiative of the Commission, amendments to the Railway Act were secured in 1911, upon which was based the new fire regulations of the Dominion Board of Railway Commissioners and the organization of the Fire Inspection Department of the Board. These regulations apply to all railways under the jurisdiction of the Railway Commission, comprising 82 per cent of the railway mileage of Canada. The legislation empowers the Commission to require the railway companies to maintain an efficient fire-fighting force, to patrol their lines, to plough fire guards and to remove all combustible material from their property; it also places upon the railway companies responsibility for all fires started by locomotives. The regulations are administered under the direction of the Chief Fire Inspector of the Railway Commission, who is also Chief Forester of the Commission of Conservation. The efficiency of the railways in fire protection has been greatly increased, and they have become a minor source of forest fire damage, instead of one of the major factors. Further efforts are still necessary to secure a similar degree of efficiency in fire protection work on the Canadian Government railways and on provincially chartered lines, none of which is subject to the jurisdiction of the Board. Material progress has already been made in this direction, and a betterment is anticipated.

Representations have also been made to the governments concerned, in favour of improved policies and administrative measures generally in connection with the management of Crown timber lands. The fundamental idea has been to secure the reservation of all non-agricultural forest lands for permanent timber production. To this end, the classification of all lands in advance of settlement has been advocated, as well as the inclusion within permanent forest reserves of all lands found to be chiefly valuable for the production of timber. Following the recommendations of the Committee on Forests, the reservation was secured of an area of approximately 17,900 square miles on the east slope of the Rocky mountains.

The Dominion Government has been urged to make suitable provision for the establishment of a section of forest investigations in the Dominion Forestry Branch, such section to be charged with the conduct of scientific studies in the field, to furnish a permanent basis for Canadian forestry practice. Scientific research in connection with the utilization of forest products has already been largely

provided for by the Dominion Forestry Branch, through the establishment of the Forest Products Laboratories at McGill University. However, research is urgently needed with respect to logging operations and the investigation of conditions on cut-over and burned-over lands. A beginning in this direction has been made by the Commission of Conservation through special studies of conditions in the Trent watershed of Ontario, the reproduction of commercial species in southern British Columbia, and the forestry situation on Dominion lands. It is believed, however, that the Dominion Forestry Branch should be strengthened to enable it to carry on such investigations in a broad and comprehensive manner.

The Committee on Forests has advocated also the establishment of forest services in provinces now without such specialized organizations. Such organizations should administer not only the fire protection work but also the supervision of cutting operations on Crown lands, in addition to any other phases of forest work, such as planting, etc.

Considerable attention has been paid to the problem of the disposal of slash resulting from logging operations. Other measures advocated for the reduction of the fire hazard have been the disposal of debris resulting from waggon-road construction and of inflammable matter immediately adjacent to railway rights-of-way.

One of the most valuable investigations undertaken under the direction of the Committee on Forests is the inventory of the forest resources of Canada. Such surveys have been completed in British Columbia and Saskatchewan. The information for Nova Scotia was collected by the Provincial Government and the report was printed by the Commission of Conservation. A forest survey of New Brunswick Crown lands is now being conducted by that Province. In this work, the Commission of Conservation has co-operated to the fullest possible extent. The Commission is also about to undertake an investigation of the forest resources of Ontario in co-operation with the provincial Department of Lands, Forests, and Mines.

The proceedings recorded in this volume include papers, discussions and recommendations along many of the lines mentioned in the foregoing summary.

Committee on Minerals: While the mining industry, in common with practically every other branch of primary production in Canada, offers an exceptional field for exploitation, the opportunity and need for conservation effort are equally apparent. The studies of the Committee on Minerals have, therefore, been directed toward the

elimination of waste, as well as to securing greater development of the mineral resources of the Dominion. With respect to metal mining, there is relatively little avoidable waste but, chiefly for economic reasons, Canadian metals have been refined mainly in the United States. It has, accordingly, been an important part of the Committee's activities to study how conditions in this respect may be changed to permit and encourage the smelting and refining of ores in Canada.

The heavy death rate among mine workers in Canada, and the closely related subjects of efficient mine-rescue and first-aid work, received the Committee's early attention. In regard to these matters a gratifying improvement has since taken place.

Following a thorough study of the coal mining situation in Canada measures have been taken by federal and provincial authorities to reduce the waste which has characterized this branch of industry in Western Canada. Attention has been drawn especially to the possibilities of utilizing the immense supplies of lignite coal in the Prairie Provinces, thereby extending the market for Canadian coal, and providing a cheap and assured source of fuel for domestic and power purposes. In this connection, considerable work has been done to encourage the establishment of by-product coke ovens and of the valuable subsidiary industries which are based on the utilization of coke oven by-products. Particularly during the past year much progress has been made in Canada in extending the use of the most modern methods of producing coke. Legislative action has also been secured with a view to checking the waste which results from the careless abandonment of natural gas wells.

The discovery, in the summer of 1915, of phosphate of lime in Rocky Mountains park by officials of this committee constituted an example of constructive conservation which should ultimately be of great value to the agricultural, as well as to the mining, industry. Should the deposits prove extensive they will form the basis of a fertilizer, the manufacture of which is not only essential to the predominant industry of Western Canada but important also as a branch of mineral production.

In view of the peculiar position of the Dominion with regard to fuel and power supplies—the distance between her coal-fields, her dependence upon the United States for anthracite coal, the possible utilization of western lignite for both fuel and power development—the Committee on Minerals has undertaken a comprehensive study of the sources, respective amounts and costs of the various kinds of power used in Canada. The importance of this investigation is emphasized very clearly by the conditions which have pre-

vailed throughout Canada during recent months in respect to supplies of power and fuel. When complete, the survey should prove of incalculable assistance in determining the best methods of solving Canada's problems and meeting her requirements along these lines.

During the past year, the officials of the Committee on Minerals have, in co-operation with the Canadian Mining Institute and other bodies, been engaged chiefly in studying the methods whereby the mineral resources of Canada can best be developed and utilized to promote Canadian industrial growth and the economic independence of the empire. The committee report for the year deals in detail with the various resources available.

Waters and Water-Powers: The initial task confronting the Committee on Waters and Water-Powers was to secure the administration of water-power resources as a public utility, conserving for the community the increment in value which will inevitably accrue to water-powers of large capacity and favourable situation. As a result of the remarkable advances of recent years in the development, transmission and use of electrical energy, water-powers have become such an important factor in domestic and industrial life that they can no longer be properly included under the category of private property. Accordingly, at its inaugural meeting in 1910, the Commission urged that, in future, water-power rights should be alienated solely under conditional and limited leases, to be granted only after thorough investigation of the property involved and to provide amply for development within a reasonable period, for public control of rates, and for the payment of an adequate rental, to be revised at regular intervals. The Dominion Parliament subsequently enacted water-rights legislation embodying the principles set forth in the Commission's recommendations. In the majority of instances where the matter is under provincial jurisdiction, similar laws have been enacted. The necessity for carefully guarding against attempts to circumvent the statutory regulations, under the guise of charter rights, has been well exemplified in several instances where the Commission has successfully opposed the granting of applications for charters which, if approved with their original provisions, would have placed extremely valuable water resources beyond effectual public control. The recent decision of the Supreme Court of the United States, declaring the charter of the Long Sault Development Company to be unconstitutional, directs attention to a prominent case of this nature. The Commission of Conservation strongly opposed the proposal of this company to dam the Long Sault rapids on the St. Lawrence river, and thereby seriously affect Canadian interests in several important respects.

Regarding the engineering, as distinct from the legal, problems in conserving waters and water-powers, the chief undertaking has been that of a national stock-taking of Canada's water-power resources. This survey has progressed steadily, the results comprising a series of exhaustive reports. In this connection, the Commission has also been instrumental in encouraging federal and provincial executive departments to undertake more thorough investigation of water-power resources, particularly with regard to systematic observation of stream flow. Respecting the problems of preventing the pollution of streams and safeguarding the purity of domestic water supplies, careful studies have been made of municipal water and sewerage systems, including the sources of water supply and methods of sewage treatment and disposal. Complete reports, containing the principal physical data concerning practically all public service systems throughout Canada, have been published. The Commission has also been active in securing the creation of forest reserves to preserve and enhance the regularity of stream flow through proper protection of forest growth on watersheds. The aforementioned reservation of an area of 17,900 square miles on the eastern slope of the Rocky mountains constitutes the most notable achievement in this direction.

The great variety of essential purposes served by the resource to which this committee's activities relate gives rise to a very wide diversity of problems, both domestic and international in character, the successful solution of which requires constant study, frequently over an extended term of years. Conservation questions of exceptional gravity are constantly arising with respect to international waters, in connection with the pollution of streams and the diversion of water for power, sanitary, irrigation and navigation purposes. Such matters are under the jurisdiction of the International Joint Commission, a strictly judicial body, and the Commission of Conservation has, upon several occasions, been instrumental in presenting and upholding Canadian rights.

Committee on Public Health: From its inception, the Commission of Conservation has placed a broad interpretation upon the term "natural resources," and has recognized the promotion of public health as an essential phase of its activities. At the inaugural meeting in 1910, attention was directed to the urgent necessity for devoting close study to the solution of such problems as the prevention of tuberculosis and typhoid, the lessening of occupational diseases and industrial accidents, the proper protection of the health of school children and the checking of infant mortality. In seeking to improve public health conditions, whether through educational

effort or legislative reform, particular importance has been attached to sanitary housing, a pure and adequate milk supply, the regulation of light, ventilation and space conditions in factories, shops, etc., and the safeguarding of water supplies from pollution.

In 1910, a Dominion Health Conference, held at Ottawa under the auspices of the Commission, brought together federal and provincial health authorities to consider the most effective methods of administration and co-operation in respect to the control of tuberculosis, prevention of stream pollution and other public health problems of national consequence. Resolutions were passed by the conference recommending the harmonization of the health laws of the various provinces, the establishment of a national laboratory and central council of health, and the enactment of federal legislation to prevent the pollution of waterways. With regard to the latter question, bills to prohibit the pollution of navigable waters by raw sewage have been, respectively, passed by the Senate and introduced in the House of Commons. Where boundary waters are concerned the International Joint Commission is giving the subject careful study while, with respect to non-navigable streams, several of the provinces already possess admirable legislation.

In the first year of the Commission's existence, an investigation into housing conditions in Canada was undertaken by the Medical Adviser. The survey revealed the fact that, largely due to the failure to provide adequate housing accommodation for the tide of immigrants, the evils of overcrowding, insufficient light, bad ventilation and drainage had already become so widespread as to constitute a grave situation. The newcomers tended to concentrate in foreign colonies in the larger cities, and housing regulations were lax in respect to both administration and legal restrictions. As it was evident that any successful method of eliminating unsanitary housing must form a part of a comprehensive system of town planning, the Medical Adviser visited Europe in 1911 to study the housing and town-planning legislation of Great Britain and continental countries. On the completion of this study, the encouragement and guidance of the town-planning movement, which had experienced rapid growth in Canada, was undertaken. The Commission of Conservation acted as host at the annual conference of the National City Planning Association, held in Toronto in May, 1914. In the autumn of the same year, to ensure the development of Canadian town-planning enterprise along proper lines, and to provide capable guidance and advice, the Commission secured the services of Mr. Thomas Adams, the foremost of British town-planners, and organized a separate branch to be directed by him. In thus identifying itself

with town planning work, the Commission is striking at the root of public health difficulties, and the town-planning branch is meeting a long-felt want in Canadian municipal life and organization.

Since the outbreak of war, the public health work has been handicapped through the absence of the Medical Adviser, Dr. C. A. Hodgetts, who is acting as Canadian Red Cross Commissioner in England, but, as will be observed from the report for the current year, every effort is being made to deal with such national problems as demand prompt and effective measures.

Town-Planning, Housing and Local Government: The Town-Planning Branch of the Commission was created in the autumn of 1914, in recognition of the necessity for taking prompt and effective measures to cope with the serious problems, both urban and rural, arising out of the rapid increase of population. Formed expressly to promote scientific town-planning, improved housing conditions and greater efficiency in connection with the general use and development of land, the initial task of the branch has been to conduct a widespread educational propaganda in conjunction with the work of obtaining adequate provincial legislation. As all the nine provinces of the Dominion differ in regard to municipal law and administration, and as there are considerable differences in other respects, *e. g.*, between the eastern and the western provinces, the study of these different laws and conditions and the adaptation of the proposals for legislation to suit each province has involved a large amount of labour. The efforts of the branch have been instrumental in securing the enactment of town-planning legislation of an advanced character in Nova Scotia and Manitoba, while similar acts have been brought forward in Quebec, Ontario and Saskatchewan. The keynote of town-planning, as advocated by the branch, is conservation of life and economy in the system of developing land. In connection with the promotion of better housing, a comprehensive study of housing conditions in Ottawa has been undertaken. On completion of this survey, a model Housing Act, constructed especially with a view to avoiding repetition of the evils revealed, will be prepared for submission to the provincial legislatures.

The Town-Planning Branch is also rendering service to numerous towns and cities throughout Canada in preparing plans and in furnishing advice and assistance respecting practical schemes for adequate control and guidance of future development. The demands for the services of the branch in this connection are much greater than can be satisfied by the staff. The branch also undertakes research work regarding problems relative to municipal government in general, and has been engaged in advocating the

establishment of departments of municipal affairs in all the provinces with a view to securing a more uniform system and a higher standard of local government throughout Canada.

To encourage voluntary effort along these lines, and to arouse a more effective public interest in civic problems, the Civic Improvement League of Canada was recently formed. The necessity for devoting greater attention to such matters, on the part of both official and independent organizations, is imperative, in view of the practical certainty of increased immigration, widely predicted as an inevitable result of the war. As will be noted from the current report of the Town-Planning Branch, the questions of colonization and of land development in general after the war, have been the subjects of very close study by the Town-Planning Adviser, whose report in this connection will shortly be available for distribution.

Committee on Fisheries, Game and Fur-Bearing Animals: The resources to which the activities of the Committee on Fisheries, Game and Fur-Bearing Animals relate are particularly susceptible to depletion. If Canada is to derive any practical benefit from the experience of other countries, especially the United States, with respect to the preservation of these resources, she must recognize that their proper conservation requires constant attention. Despite the possession of magnificent fisheries, the Canadian fishing industry has achieved no substantial increase in food production during recent years, although, under the vigorous administration of the Fisheries Branch of the Department of Naval Service, it has been rendered very material assistance in such essential matters as protective service, fish culture, biological investigation, marketing facilities, etc. Unsatisfactory conditions are revealed, both in the failure of the industry, as a whole, to expand on a scale commensurate with the opportunities, and by the actual or threatened depletion of several of the most valuable individual fisheries.

To promote development the committee has drawn attention to the necessity for reorganization of the fisheries protective service, for improved methods of grading and curing fish, and for practical instruction for fishermen in the pursuit of their calling. The Fisheries Inspection Act of 1914 should result in substantial improvement in marketing methods, the deficiency of which has, in the past, been largely responsible for the non-progression of the industry. In urging the advisability of more energetic exploitation of the home market the committee has added its efforts to the general endeavour of the fishing interests to educate consumers with respect to the value of fish as a staple food. More recently, the committee has been devoting attention to the possibility of utilizing various fisheries

resources which have hitherto remained undeveloped, and particularly to the problem of securing economic utilization of the vast amounts of waste material which characterize practically every branch of the fishing industry. In connection with the latter problem, research investigations have been conducted during the past year. The present volume contains the progress report of this work which, it is anticipated, will result in the perfecting of practicable methods of converting fish offal into high grade oils, stock foods and a variety of other valuable products.

The best means of securing the restoration of depleted fisheries, and of preventing the repetition of future depletion of these and other fisheries, have had the committee's careful study. Canada's experience with her oyster, whitefish, shad, sturgeon, lobster and, more recently, the Pacific halibut, fisheries, has demonstrated that intensive commercial exploitation must be accompanied by conservation efforts in the form of proper seasonal regulations, size limits, restriction as to fishing equipment and methods, and extensive fish culture operations. To encourage the revival of the oyster industry of the Atlantic coast, the committee facilitated the settlement of the jurisdictional dispute between federal and provincial authorities which had interposed an effective barrier to the rebuilding of this industry. It subsequently published the results of a thorough study of the life history of the oyster, a knowledge of which is essential to successful private oyster culture.

In taking up the matter of conserving the whitefish fisheries of the Great lakes, a statistical examination of the record of these fisheries proved conclusively that continuous exploitation can be carried on only in conjunction with the planting of fry on a very extensive scale. The whitefish is widely regarded as America's finest food fish, and steps are now being taken by the executive authorities to build and operate hatcheries of sufficient capacity to maintain the output of this fish. The necessity for effective conservation is equally evident with respect to such immensely valuable fisheries as those of the lobster on the Atlantic coast, the Pacific halibut, the salmon of the Fraser river, the shad, sturgeon, etc., although the best means of insuring their permanent productivity have not been definitely ascertained. While Canada's fisheries are of surpassing fertility and variety, their efficient exploitation presents many problems, economic, biological, administrative and constitutional.

The task of promoting the proper protection of beneficial wild life comprises an important phase of this committee's activities. Its efforts have been largely instrumental in facilitating the passage

of the Migratory Bird treaty recently concluded with the United States—a protective measure of inestimable value in preserving both the insectivorous and the game birds of North America. A further valuable service has been rendered the development, along sound legitimate lines, of the fur-farming industry. The decimation of Canada's fur-bearers, as a result of prolonged and vigorous exploitation, and the remarkable rise in the price of furs during recent years ensure the success of such an enterprise if properly conducted. The climate of portions of the Dominion, especially Prince Edward Island, is admirably adapted to the industry. As will be noted from the committee report for the past year, special attention has lately been devoted to securing adequate protection for the wild life of the Northwest Territories. The practical extermination of various species is inevitable, unless prompt and effective measures are taken to control the extent and methods of commercial exploitation.

Committee on Press and Co-operating Organizations: To acquaint the public with the objects and results of the Commission's endeavours, the Committee on Press and Co-operating Organizations has issued numerous bulletins and reports. Frequent use has also been made of the public platform and valuable support and assistance have been received from the press throughout Canada.

Having become identified in public opinion with the promotion of national efficiency, the Commission is constantly in receipt of requests for assistance in eliminating various forms of industrial waste and inefficiency. During the past year, in response to a particularly widespread appeal from public bodies throughout the Dominion, it undertook an investigation into the causes, extent and best means of remedying Canada's enormous fire waste—a loss which imposes a severe tax upon industry as well as upon the natural resources of the Dominion. The report containing the results of this study has now been completed and the work of passing through the press is being conducted as expeditiously as possible.

As the work of the Commission progresses, it becomes increasingly evident that the measure of success which has attended its efforts in the various branches of endeavour must be attributed largely to the fact that it is purely an advisory body. It has, in no instance, encroached upon the well-defined areas of executive duty and action, but has constantly sought to secure and to retain the hearty co-operation of the executive departments through and by which the recommendations resulting from the Commission's investigations must be placed in effect and administered.

PROCEEDINGS
OF THE
EIGHTH ANNUAL MEETING
OF THE
COMMISSION OF CONSERVATION
HELD AT
OTTAWA, JANUARY 16 and 17, 1917

THE Eighth Annual Meeting of the Commission of Conservation was held at the offices of the Commission, Ottawa, on Tuesday and Wednesday, January 16 and 17, 1917.

Sir Clifford Sifton, K.C.M.G., P.C., Chairman, being detained in England, Hon. Senator W. C. Edwards occupied the chair. The other Commissioners present were :

Dr. Frank D. Adams, Montreal, Quebec
Hon. Aubin E. Arsenault, Summerside, P.E.I.
Dr. George Bryce, Winnipeg, Manitoba
Mgr. Charles P. Choquette, St. Hyacinthe, Quebec
Hon. Orlando T. Daniels, Halifax, Nova Scotia
Dr. B. E. Fernow, Toronto, Ontario
Dr. C. C. Jones, Fredericton, New Brunswick
Hon. John A. Mathieson, Charlottetown, P.E.I.
Mr. Chas. A. McCool, Pembroke, Ontario
Dr. Howard Murray, Halifax, Nova Scotia
Dr. J. W. Robertson, C.M.G., Ottawa, Ontario
Dr. William J. Rutherford, Saskatoon, Saskatchewan
Mr. William B. Snowball, Chatham, New Brunswick

The morning session opened at ten o'clock. The minutes of the last Annual Meeting were read and approved. Regrets at inability to be present were read from the Chairman, Sir Clifford Sifton, K.C.M.G., Hon. Jules Allard, Quebec; Mr. J. P. Babcock, Victoria, B.C.; Hon. H. C. Brewster, Victoria, B.C.; Hon. Geo. W. Brown, Regina, Sask.; Hon. Martin Burrell, Ottawa; Hon. Geo. J. Clarke, Fredericton, N.B.; Hon. A. B. Hudson, Winnipeg, Man.; Prof. F. B. Linfield, Bozeman, Montana; Mr. J. F. MacKay, Toronto; Sir Edmund B. Osler, Toronto; Hon. T. D. Pattullo, Victoria, B.C.; Hon. A. L. Sifton, Edmonton, Alta.; Dr. H. M. Tory, Edmonton, Alta.

Address of Acting Chairman

HON. Senator Edwards, in opening the proceedings, spoke as follows : As Acting Chairman for this meeting of our Commission, I am much pleased to see so many of our members present. I am very sorry, however, that our Chairman, Sir Clifford Sifton, is not here, because he always interests you. Sir Clifford hoped to be back for the meeting, but finds that his work in England will keep him there till March or April. While he is not here in person, however, he has forwarded from England his annual review, in which he summarizes the work of the Commission. This will be read to you by the Assistant to the Chairman, Mr. James White.

A change has been suggested in our method of procedure for this meeting. Last year it was felt that too large a proportion of the time was taken up with papers, which, while interesting, encroached seriously upon the time available for Committee meetings and discussions of their recommendations. This year, the Chairman's address covers in a concise way the work of the staff, and the members of the staff will give their respective Committees details of the work of the past year and work planned for the current year.

As to the work performed during the year, you will have a specific statement of it in the review by our Chairman. There is one matter to which I would like to refer, however, namely, the investigations carried out during the past year on behalf of the Commission by Mr. J. B. Feilding, for the utilization of fish waste and fish offal and the uncommercial varieties of fish caught during fishing operations. He has produced oils of high quality, poultry feed, cattle feed, feed for swine, and an excellent variety of dog biscuit. His investigation has demonstrated that these valuable products can be profitably produced from an article which has hitherto been not only actually thrown away but has caused an expenditure in providing for its disposal. This is perhaps the most specific new feature of our work during the past year.

During 1916 the staff was handicapped by the absence on overseas service of two of the editorial staff, Messrs. Allan Donnell and P. M. Baldwin, two of the engineers, Messrs. G. H. Ferguson and E. C. Little, and one messenger, Mr. J. Carroll. In addition, Dr.

C. A. Hodgetts, our medical adviser, has been in England, in charge of Canadian Red Cross work there, since the death of Col. Burland in 1914.

The reduction in our appropriation last year from \$93,000 to \$80,000 has prevented us taking up many lines of investigation and has necessitated the strictest economy. The greatly enhanced cost of paper and other material entering into the production of our reports has seriously increased the cost of them.

**Our Resources
Over-Estimated** There is one thought that comes to my mind, and that is this : Canadians have an idea that Canada is a country of unbounded and unlimited natural resources. From its very inception, the Commission has undertaken to ascertain just what our natural resources are. Outside of agriculture, which is our great and fundamental resource, lumbering, mining and fishing are the only resources that Canada has. In agriculture our resources are very great, and it is the department in which most can be done for the promotion of the welfare of Canada. The greatest work that can be done in any department of Conservation is to promote good agriculture. Education that will lead, not to the diminution of the productiveness of our land, but such as will increase that productiveness, will be of the greatest possible benefit.

**Lumbering is
Disappearing** In the eyes of the public lumbering takes the next place in importance. But in that—speaking as a lumberman—a very great mistake is made. Canada is not a very great lumbering country. It was, at one time, a very considerable lumbering country, and might yet be, but it will be only a few years when lumbering will be so reduced that, excepting west of the Rocky mountains, it will be a very small industry indeed in Canada. This is a very serious matter, and should be one of the most important questions in this country. Each province very largely over-estimates its resources in that respect. In fact, I know that, east of the Rocky mountains, our resources are enormously over-estimated, and I may say that they are over-estimated west of the Rocky mountains, too. There are those who believe that, with the disappearance of actual lumbering, this country is to become a wonderful pulp producing country. But, if the same methods of administration—not of operation—are applied to the production of pulp and paper as have been applied to lumbering

Canada will not have a very long life in that respect either. The great enemy of our forests has, of course, been fire, and the great primary causes of fire have been illegitimate settling and the improper clearing of our lands. Railways have had their part, of course, and the lumbermen may have been sinners to some extent, too, but those I have named are the fundamental destroyers of the forests of Canada. There is a current idea that, as you go northward, there are inexhaustible reserves of timber ; but the fact is that, as you go north, the growth is less. When you get to the district traversed by the National Transcontinental railway the timber grows very slowly, and, once it is cut, owing to the much slower growth, it will be hundreds of years before there will be reproduction. The question of our timber resources and their preservation should be one of the primary studies of the Canadian people, because we will not continue to export timber products for many years, except, possibly, as I have said, west of the Rocky mountains, unless different methods are followed to secure the preservation of our forests than those which have prevailed for many years past. I repeat that, even as regards pulp wood, the same thing will apply, unless effective remedies are adopted.

I am afraid that Canada over-estimates her possibilities. This is a northern country, a dear country to live in, and a dear country to produce in, and must continue to be so. We have the advantage of a good climate, which produces a strong people. That is perhaps our greatest resource. While we have difficulties, we have the energy to overcome these difficulties. In addition to that, if we do not conserve that which we inherit, there is a time coming when it will be a very bad day for Canada. I just throw out these hints for what they may be worth.

I understand Mr. Snowball has a resolution to offer as to the death of one of our members.

RESOLUTION ON DEATH OF MR. JOHN HENDRY

MR. SNOWBALL : Mr. Chairman and gentlemen, since we last met, our Commission has suffered the loss of one of its most valued members, in the person of Mr. John Hendry, of Vancouver, B.C. Mr. Hendry has been in failing health for a long time, which had

prevented his attending the annual meetings of this body. His interest in the work of Conservation, however, never flagged, and, with his wide vision, he looked forward to the future when the objects for which we are striving shall be attained. We shall miss his help and advice in our deliberations, and I am sure every member will join with me in asking that an expression of our regret at our loss and our sympathy for those he left behind, be placed on our official records. I would therefore beg to move :

“That this meeting of the Commission of Conservation desires to express its sincere sympathy with the family of our late member, Mr. John Hendry, whose death occurred on July 17th, 1916.”

The resolution was seconded by Dr. Fernow, and adopted.

Mr. James White, Assistant to the Chairman of the Commission of Conservation, then read the following review of the work of the Commission, forwarded from England by Sir Clifford Sifton:

Review of the Work of the Commission

BY

SIR CLIFFORD SIFTON, K.C.M.G., P.C.

Chairman, Commission of Conservation

GENTLEMEN : The war has agitated every British country to its foundations. It has caused a searching of heart which the world has not known before in modern times. Among the most remarkable of its results has been the re-examination which each nation has been compelled to make with regard to its material resources. The gospel which we have been preaching for some years past has now been found to be the true gospel. It has been found by hard experience that national safety demands that the nation should not only possess resources but understand them and be able to utilize them economically. Whereas, a few years ago people listened to the discussion of this subject with polite but somewhat academic interest, they now know that no subject is of more importance to the national well-being, and that the lack of developed capacity to utilize every possible resource may in certain emergencies mean disaster. Therefore, though it be a time of war, when thoughts of war and matters relating directly to its conduct occupy people's minds almost exclusively, yet it has become clear, through the very lessons taught us by the war, that our work is of the most far-reaching importance. Every consideration points to vigorous and aggressive action rather than to postponement or delay.

We find that the people of Canada recognize this fact in the most practical way possible. Our Press and Publicity Committee reports that during the past year a greater space than ever before has been devoted to conservation, notwithstanding the urgent demands upon the press by war news and cognate matters. Few debates on public affairs take place without reference to the subject, and no one who speaks of it fails to recognize its importance. The Government has issued various commissions, most of which are charged with work which in one way or another relates to that which has been committed by Parliament to our especial care. Branches of public departments which were formerly indifferent are now anxious to show their interest. We may therefore conclude that the time has arrived when we need no longer devote time and attention to arousing interest in the subject of conservation. We shall henceforth be

able to devote ourselves more exclusively to the work of investigating and advising on the attainment of ends which are universally commended as essential to the highest degree of national welfare.

Reason for Commission's Existence	In doing this it is necessary for us to keep steadily in mind the real reason for our existence. We must resist the tendency inherent in official bodies to become mere publishers of blue books. It is our business to exercise original thought in collecting and applying information that is of immediate practical benefit. It is our sole business to promote the economic utilization of resources. All other matters, howsoever interesting, should be rigidly excluded as not coming within the proper scope of our duties.
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Owing to domestic circumstances arising out of the war, I was unable to deliver my accustomed review of the year's work at the last annual meeting. I regret that I find myself again, unexpectedly, obliged to be absent. I have, however, by correspondence, kept in touch with the work of the staff, and, after making certain investigations in England, which, I trust, may bear fruit in the future work of the Commission and in the future development of Canada, have suggested the subject which is to furnish the principal topic of discussion at this meeting.

Our purpose in annually selecting subjects to which special attention is directed at our meetings is to collect in a form readily intelligible to the general reader, information which may lead to special development of the principle of conservation. Our publications, particularly the reports of our annual meetings, have a very wide circle of readers among the most mentally alert and progressive of Canadians. We have, therefore, the power to accomplish a great and useful work if we devote ourselves to it with care and thoroughness and keep up the standard of our publications.

National Stocktaking	All the civilized and progressive nations of the earth are today anxiously taking stock of their resources. They have found that the practice of trusting to others for the necessities of civilized existence is fraught with danger and uncertainty. They have learned that a nation can only surely count on that which lies within its own borders and is capable of being guarded against forcible exploitation by enemies.
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The possession of Alsace and Lorraine, with their rich mineral resources, enabled Germany to challenge world supremacy in the iron and steel trade. The further loss of her industrial and mining districts in the early stages of the war has sorely embarrassed our noble ally France. It was not for nothing that the German army

retreating from Paris planted its lines where they enclose within German control the great producing industries of northern France. A practical appreciation of what really constitutes national power and really places a country in a position to resist encroachment has been the key to German strength and resisting power. It has been no accident of circumstance, but the result of logical thought. Beyond all doubt, in this development of economic thought Germany has been a generation in advance of the rest of the world. She has long seen the necessity of making her home industries supreme in the complete utilization of her resources. She has even gone beyond that conception and has acquired in some striking cases a monopoly of the knowledge of fully utilizing the resources of other countries. From the metals of Australia and America, the coal tar of Great Britain, the natural products of Africa, she has accumulated the financial resources which have enabled her to withstand a strain unexampled in the history of modern nations.

Greatest of
All Resources

While carrying on these world-wide activities Germany has not neglected the greatest of all resources—the productivity of the soil. She has imported enormous quantities of the agricultural fertilizers produced throughout the world. To these she has added the by-products of her own mining industries. By these means she has steadily climbed upward in the scale. The latest information available before the war indicated that she had first equalled and then surpassed her competitors in average agricultural production.

While, therefore, we hate and condemn the spirit of aggression, of oppression, and of ruthless brutality, let us take careful note of the great economic lessons which are written plainly in the history of this world conflict.

Today, England realizes that the food question is paramount. For a generation wise men have been telling the people of England that she should look to her agriculture and her food production. The people listened and did nothing. Now, under the hard spur of necessity, they are forced to do wastefully, uneconomically and in mad haste what should have been done scientifically, economically and at least a generation ago. Millions of acres which could produce much are producing little. Cases exist where intelligent application of scientific methods have doubled the output of single farms in four or five years. Around them lie scores of farms of equal natural fertility still cultivated in the old way. A realization of these facts is slowly but surely sinking into the national consciousness, and it is not a wild or impossible prediction that one result of this war will be to bring forth a transformed Britain, which

will show the world that the British Isles can produce their own food.

Slow Increase
in Food
Production

The economic history of the world immediately prior to the war showed that the great nations were feverishly devoting themselves to the production of manufactured goods. The volume of manufactured goods, in proportion to population, increased with great rapidity. The proportionate volume of food production increased but slowly. Food needed no sales agents to secure a market. We know that, in this great Dominion, with its vast capacity for production, we failed to completely supply our own food requirements, and many articles of food are now selling at prices far beyond a legitimate commercial basis. Could there be a more striking proof of national inefficiency and of faulty organization?

The productivity of the soil, the capacity to produce the greatest possible quantity of food, is a national question of the first magnitude. No material question can be more important than that of conserving and increasing fertility. Let us then put before ourselves this question:—

Can we advantageously and economically apply to the soils of Canada a fertilizer which can be economically produced in Canada?

I am told that two hundred and fifty thousand tons of sulphate of ammonia, a useful fertilizer, are annually exported from England. The manufacturers make profits, but the country loses by every ton that is exported.

Wasteful
Use of Coal

We have a large and growing coal industry in Canada. In the west we have vast fields of coal along the foothills of the Rocky mountains. The problem of fuel is a vital one to the people of the Prairie Provinces. Increasingly, as the wood disappears, they are burning coal. Is it too much to hope that this wasteful use of coal will be brought to an end? Is it too much to predict that, before many years, coke will be the fuel and that the by-products now dissipated in smoke and ashes will furnish the fertilizers which will render yet more and more productive the grain fields of the west? The nitrogen which is required to re-invigorate exhausted soils exists in unlimited quantities in the atmosphere. The use of water-power on a huge scale is the principal economic method of extracting this nitrogen from the atmosphere and rendering it available for practical use. No country in the world is so richly endowed with water-power as Canada, and many of the greatest of our powers lie so remote from large centres of population that they fairly radiate the suggestion of adaptation to the necessities of such industries.

Science
Must Assist
Industry

Let us not be afraid of the magnitude of these problems. The manufacturers of Canada in this war period have stepped out into a world sphere. They have accomplished work which a few years ago they would not have had the courage to contemplate. Necessity was the spur. Let us get rid of the idea that, because we are a comparatively new country, we must lag behind. We have solved great problems, of a different nature, it is true, but not less difficult. Nothing in all these questions even approximates the difficulties which the Canadian people have overcome in reaching their present position. But we must be alive to the necessity of proper methods. Amateur work is no longer of any value. We require to have a corps of the brightest and best of our young scientific students trained in all the scientific knowledge upon which the great basic industries of the world have been built up. So, and so only, shall we lay a foundation upon which we can rear symmetrical organization which shall utilize to the utmost extent every natural advantage which we possess.

I turn now to the work of the year.

Town
Planning

Our Town Planning Adviser, Mr. Adams, has had a busy year. There is hardly a part of the country where his wisdom and experience has not made itself felt. Civic Improvement Leagues have been established to stimulate and watch over the progress of the movement. Some of our most influential and public-spirited citizens have identified themselves with these Leagues and are giving their active support. Work has been accomplished in every province. Town Planning Acts have been drafted and discussed and arrangements made looking to their adoption. Town planning schemes are being prepared for the cities of Halifax and St. John. Housing conditions in Halifax have been partially examined. A housing survey of Ottawa is in progress. It would appear that a great deal of work has been done in Ontario and many civic bodies have given their support. Nevertheless the Government of the Province has not yet been sufficiently impressed to promise action. It is earnestly hoped that the wealthiest and most populous province of the Dominion will not fail to appreciate the importance of this work. The town planning movement asks for no bonus and seeks, not dividends, but the public benefit. I am impressed by the examination of Mr. Adams' work with the idea that by the exercise of great energy and tact, united with his mastery of the subject, he has been able to bring about a very successful inauguration of town planning work in Canada. When, however, we look at the vastness of the work to be done, we must realize that it is only begun. In fact the

real work of actual improvement can hardly be said to have begun. Absence of competent and experienced advice in the next few years will be highly detrimental. It is my sincere wish, therefore, that we may be able to retain Mr. Adams' services for another period of three years. In the meantime we may endeavour to secure for him an assistant who, under his training, may become qualified to carry on the work when he is no longer able to remain with us.*

When the work of this Commission was undertaken one of the very greatest tasks before us was the establishment of an effective system of fire protection over forests lying along the lines of Dominion chartered railways. No powers were vested in anyone. No legislation was in existence. The condition was absolutely chaotic. Moreover, there was a pretty general belief among those who knew and deplored the situation that the difficulties in the way of an effective solution of the problem were insuperable.

In former years I have been able to record how, step by step, the various difficulties have been surmounted. Not, however, until the present year have I been able to announce that the system of railway fire protection has attained its objective and that fire losses due to railway locomotives on Dominion chartered railways have been reduced to a minimum. Henceforth our chronicle upon this subject will be confined to recording what I hope will be a steady progress toward the highest possible completeness and efficiency. What has now been done constitutes a great and notable achievement. That it has been successfully accomplished in pursuance of plans proposed by the Commission some years ago, we must attribute largely to the tactfulness, energy, and capacity of our Chief Forester, Mr. Leavitt.

With regard to forest fire protection generally, some progress has been made. 'The permit system for settlers' clearing fires has been adopted in most provinces and works fairly well. Steady work is required in effecting improvements in laws and their enforcement.

It is noted with particular satisfaction that the Province of Ontario, which, it is not unfair to say, has unduly lagged behind, has now been stimulated by the terrible fires of last summer to take steps in the way of improvement. The Minister in charge of Lands and Forests has now promised that the subject will be taken up and an effective modern organization put into operation. We trust that this will be done without delay. For myself, I express a very

* Subsequent negotiations have resulted in the conclusion of a three-year agreement with Mr. Adams.

strong hope that, in working out this plan, a means will be found of providing for co-operation between the Chief Forester of the Province and the Faculty of Forestry of the University of Toronto, presided over by our distinguished friend, Dr. Fernow. We suffer in Canada from a too slavish adherence to old-fashioned academic methods. We do not yet sufficiently realize that science is the willing handmaid of progress. It ought not to be beyond the constructive capacity of those in authority to find a method by which the practical scientific knowledge of the professor of forestry should be available for the benefit of the forest service and the forest service in its turn would afford a systematic method free from the burden of political patronage, of training up the students of the University in the great work of conserving the forest resources of the province. In this way we should have a rapidly increasing volume of trained scientific opinion which would soon bring about valuable results.

Good work has been done by the province of New Brunswick in the forest survey and land classification of Crown lands. Our staff has co-operated in this important work. Its purpose is to determine in advance what land is suitable only for maintaining forest growth and what is suitable for agriculture. In this way the mistake of allowing settlers to take up land from which they can never earn a livelihood will be avoided. The Dominion Department of Interior is, I believe, giving some attention to the same subject. So also is the Government of British Columbia. But it is in Quebec and Ontario that the most urgent necessity exists for this work being undertaken systematically. I believe something has been done. I am not fully informed how far the system has been developed. In Ontario, where much of the settlement took place before any of us were educated to our duty in these matters, irreparable damage was done to the province and a grievous wrong was inflicted upon large numbers of people by allowing them to settle on unsuitable land. The Trent Valley is the standing example of what happens in such cases. In our present state of enlightenment on this subject, there is no excuse for any government, in Ontario or Quebec, repeating the mistakes of their predecessors.

Forest Resources.—The inventory of the forest resources of Canada is proceeding. The reports on British Columbia and Saskatchewan will be published during the coming year. They will be authoritative statements which may be referred to with confidence. Mr. Craig and Dr. Whitford will report, *inter alia*, that, of the 250,000,000 acres of British Columbia, 92,000,000 are absolute forest land and that, of this area, 33,000,000 acres carry commercial timber. The

remainder has been burned and is now more or less covered with young growth. One half of the 33,000,000 acres which carries commercial timber has been partially damaged by fire, so that, of 92,000,000 acres of absolutely virgin forest land in British Columbia, only about 17,000,000 remain entirely uninjured by fire. It is surely evident that we have not got to work too soon to make a record of this fact and to inaugurate better methods of protection.

The stand of merchantable timber is reported by our investigators to be about 360,000,000,000 feet. It is satisfactory to know that, between the railway fire protection system and the provincial service, active measures are being taken for protection. We sincerely hope these measures will prove effective.

The annual growth of timber in British Columbia is five or six times the amount of the annual cut, so that, if cutting be properly regulated, a great increase in the annual production might be made without impairing the permanency of the supply.

An investigation of the forest resources of the Province of Ontario, to be followed, we hope, by similar work in Quebec, will now be undertaken. This work is particularly opportune at the present time. Undoubtedly the rosy predictions of the past regarding development of the pulp and paper industry are about to be realized. Other sources of supply are failing. Rapid development in the near future seems to be certain. It is, therefore, of the first importance that there should be a careful stock-taking of our pulp-wood supply, so that a rigidly scientific method of use may be enforced, and the total cut in each year strictly limited to the amount of the annual increment of growth.

Special attention is directed to the fact that the white pine tree, the king of the eastern Canadian forests, is now threatened by a deadly enemy, the white pine blister rust. It has already travelled from Europe to the United States and from the United States to Canada. It is understood that the governments of Ontario and Quebec are endeavouring to grapple with the evil. It must be stated in the most unqualified way that no expense should be spared. The parasite is deadly and most difficult to eradicate. The government departments whose duty it is to deal with this matter bear a heavy responsibility.

Agriculture The main features of our agricultural work in the past year are our co-operation with the work of land classification in New Brunswick and the agricultural survey of the county of Dundas, Ont. The latter is an important branch of agricultural work which has been under consideration for some time. The county of Dundas was selected as a fair repre-

sentative of a certain type of county in Ontario. The plan was to enquire into everything that affects the life of the farmer, with special reference to the possibility of increasing agricultural production. Reports will be laid before you. From the detailed study of these reports it is hoped that some means will be evolved for bringing about permanent improvement without following the old and well worn method of invoking aid from public funds. Some obvious lines of improvement are at once suggested by a preliminary examination of the results of the survey, but it would be premature to make any suggestion until a careful study of the whole subject has been made.

I congratulate the Government of Ontario upon the appointment as Commissioner of Agriculture of Prof. Creelman. The appointment is a most gratifying recognition of the prime importance of our greatest natural resource and of the excellent work done by Prof. Creelman as Director of the Ontario Agricultural College at Guelph.

Water and
Water-Powers

This branch of our work will always remain of the utmost importance, though some of the features which were prominent in earlier years have naturally become less so through accomplishment of ends which were aimed at.

The most important features of the regular work at present are the completion of the reports on British Columbia, the Prairie Provinces and northern territories. The latter report has been issued and the former is being finished. This series of reports renders available for public use information respecting practically the whole of our water-powers. This important work has been accomplished in a very short period of time and at a minimum expense.

A new and improved edition of the report on "Water-works and Sewerage Systems" has been issued. It will, no doubt, prove of great practical utility. Any municipality in Canada intending to establish waterworks or sewers can, from this report, ascertain with completeness and exactitude the nature, extent, method of construction and cost of every system installed in Canada. It is evident that the existence of such a book must be a most efficient adjunct to the work of health administration.

A power survey is under way. When completed, it will, at a glance, give most complete information regarding the power plants of the Dominion.

These three series of reports, when completed in the near future, will furnish an intelligent basis for future work, and will constitute in themselves a compendium of information which no hydraulic engineer in Canada can dispense with.

On the subject of the work of this branch it remains only for me to record that, as usual, our staff has found the opportunity of serving the public advantage by assisting in preserving valuable public rights.

In this connection it is my duty to call attention to the fact that the so-called Chicago Drainage canal continues, illegally, to divert waters from the Great Lakes system, resulting in serious loss to navigation and other interests dependent upon the use of these waters. It is believed that the amount of water being diverted greatly exceeds the quantity for which permit was granted by the United States Federal authorities. If this is the case, a remedy should be applied. I suggest that the Commission at its present sitting should hear the evidence in possession of our officers, and make additional protest, or take such other action as may be appropriate.

The position regarding the export of electrical energy requires great and close attention. Coal and other fuels serviceable for power development are becoming both scarcer and dearer. In 1916, Dr. George Otis Smith, Director of the United States Geological Survey, stated that:

"Cheap power promises to be in some future century this country's largest asset in the industrial rivalry among nations. Our unsurpassed coal reserves reinforced by these water-power resources constitute a strong line of national defence, in that they form the real basis for an industrial organization of the nation's workers. It is only through abundant and well-distributed power that the other material resources of the country can be put to their highest use and made to count most in the nation's development. The people's interest in water-power is greatest in its promise of future social progress, and such an interest is well worth protecting."

Ten years ago, the Committee on Rivers and Harbors of the United States Congress urged that the chief and most important means that could be employed for improving the power conditions were:

First, the utilization of every American water-power to its fullest extent;

Second, a more general location of manufacturers close to sources of fuel supply;

Third, the adoption of highly economical steam-driven power plants and more efficient methods of distributing and utilizing the energy.

On February 8th, 1910, we filed our protest against the granting of the application of the Long Sault Company for permission to dam the Long Sault rapids of the St. Lawrence. Ultimately, as the result of the opposition initiated by us, it was defeated.

Later, the charter granted the Long Sault Company by the State of New York was declared unconstitutional. Later, the company made strong efforts to secure a re-establishment of its status with reference to its former charter. The case was argued before a bare quorum of the United States Supreme Court, April 14th and 17th, 1916. In view of the importance of the case, it was re-argued before a full bench, October 31st, 1916. On December 11th, the Court rendered its decision and *dismissed* the company's application.

It is noteworthy that, when arguing in the April hearing, counsel for the Long Sault Company stated that, "when the present embargo against the building of dams has been raised, we [the company] will proceed again to obtain that consent."

The present situation at Niagara fully vindicates—if vindication were necessary—the strong stand taken by our Commission in opposition to the Long Sault Company's proposal to dam the St. Lawrence river at the Long Sault rapids. Our policy is set forth in the following statements quoted from our protest of February 8, 1910:

"Should the time come when further power is demanded by Canadian interests, and the placing of a dam across the St. Lawrence river is determined upon, one-half of the power to be generated thereby will belong of right to Canada and should be permanently retained for Canadian use without any exception or qualification.

"The suggestion that power can be generated on the American side, or generated on the Canadian side and exported to the United States, and that, thereafter, when it is required in Canada the company can be ordered to deprive its United States customers of the power and deliver it in Canada, is regarded as being entirely illusory. If the power is used in the United States, industries will be built up and vested interests created thereby, which it will be impossible to ignore. The attempt to enforce an order for the delivery of power on the Canadian side after it had for years been exported to, or used in, the United States would lead to serious difficulties. The case is not the same as if the company and its works were wholly within Canada. If the company desired to avoid or resist such an order, no means would exist of enforcing it without resorting to steps which would be a sure road to international complications."

Officials of the State of New York have stated that, in handling their case against the Long Sault Development Company, they were much assisted by having available the information published in the reports of this Commission.

Minerals

One of the consequences of the war has been to shut off some of the usual supplies of minerals from other countries. We have, in consequence thereof, been called on to furnish information on the processes of manufacture of different varieties of products.

At the request of the War Purchasing Commission the services of our mining engineer were placed at its disposal for some weeks in the summer. The Canadian Mining Institute also asked for his assistance and co-operation on a special committee appointed at the request of the Minister of Trade and Commerce to report on the further utilization of the mineral resources of the Dominion, and to ascertain the extent to which Canada can assist in supplying the mineral requirements of the Empire. The investigation was of necessity lengthy and laborious. The results have been embodied in a report to the Minister of Trade and Commerce. With regard to the value of these and similar reports, I have had presented to me in England very striking evidence of the method in which they are appreciated by people who are enquiring into our resources with a view to investment and development. They are highly appreciated by those most competent to judge and will be of undoubted advantage to the country.

The Dominion Steel Corporation has recently added to its by-product coke oven plant by the purchase of 120 Koppers ovens, and the Nova Scotia Steel and Coal Co. is now building an additional 40 Bernard retort coke ovens. I congratulate these companies on their progressiveness. It is extremely gratifying to find that our recommendations along these lines are bearing fruit. These ovens will recover the coal tar, which contains the elements entering into the manufacture of a whole series of valuable substances—coal gas, for heating and illuminating purposes, benzol, toluol and other raw materials for certain explosives, aniline oil, from which aniline dyes are manufactured, and ammonia liquor, from which is produced sulphate of ammomia, the resulting product being largely used as a fertilizer.

**Fish, Game and
Fur-Bearing
Animals**

The work of this branch has, during the past year, presented features of unusual interest.

The treaty with the United States for the protection of migratory birds of North America is a matter for gratification. It is a concrete case of international co-operation in conservation. Steps are now being taken to secure appropriate amendments to the provincial Game Acts.

The necessity of more effective protection of fur-bearing animals of the far North-west territories has become urgent. Dr. C. Gordon Hewitt has been good enough to give attention to the subject, and he might with appropriateness be asked to address you on the subject. The facts disclose a condition of affairs which calls for immediate action. Large operations in the way of exploiting the fur trade of those regions are in contemplation, which, if permitted, will almost exterminate the fur-bearing animals of what is one of the greatest preserves in the world.

We have already secured the establishment of a gigantic forest reserve on the east slope of the Rocky mountains which will, in time to come, if properly administered, be a game as well as a timber reserve. The complement of that enterprise is the proper protection of the animals which now have their habitat farther north. Representations have already been made to the Prime Minister and to the Minister of the Interior, and I suggest that a committee of this Commission should wait upon them both and urge immediate action at the coming session.* There is no time to be lost. One year of the contemplated operations might have a serious effect. Legislation is all that is required. No appreciable expense will be incurred. These regions are now patrolled by the Mounted Police, who are efficient game wardens. All they require is the law and instructions to enforce it and the work will be done.

The proceedings of the Fisheries Committee, which were published in July, have received considerable attention, and it is, in consequence, possible to record substantial progress in the work of protection.

Experiments have been conducted, under the instructions of the committee, by Mr. J. B. Feilding, with reference to the possible utilization of waste products of the fishing industry. It is believed that the results of the inquiry may be to establish economic methods of converting these waste products into valuable commodities.

A study of the whole position of our fishing industry results in some reflections which are rather disquieting. While the value of our annual product is rising, a close examination reveals the

*Since the above was written, the Dominion Government has appointed an Advisory Board on Wild Life Protection composed of

Dr. R. M. Anderson, Geological Survey

Mr. J. B. Harkin, Commissioner, Dominion Parks Branch, Dept. of Interior

Dr. C. Gordon Hewitt, Dominion Entomologist, Dept. of Agriculture, *Secretary*

Mr. Duncan C. Scott, Deputy Superintendent General Dept. of Indian Affairs

Mr. James White, Assistant to Chairman, Commission of Conservation,
Chairman.

fact that the rise is mainly due to increase in price, rather than quantity. The increase in amount of annual output is small. Nevertheless some of our most valuable fisheries are in danger of extinction. While it is not possible to seriously restrict the output of food products during a period of war, scarcity and high prices, the subject is one which demands the most careful attention of the Department of Marine and Fisheries.

For the first time since the inception of our work we are able to present an exhaustive and thorough treatment of the question of fire waste in Canada. The report is impossible to summarize. It must be read to be understood. It will, I have no doubt, attract a great deal of attention and should assist in bringing about a reform in this most glaring and indefensible violation of the principles of conservation of values.

As a result of the enquiry we find that Canada has the greatest fire loss per capita of any country in the world from which statistics are available. The per capita loss is constantly increasing. Conditions are growing not better but worse.

Fire losses in Canada during last fifty years were.....	\$350,000,000
Losses in year 1890.....	5,500,000
Losses in year 1914.....	21,500,000
Increase 290%	

From 1890 to 1914 population increased about 67%

New buildings erected 1914.....	91,000,000
Of these were erected to repair fire losses.....	21,500,000
Fires and fire protection cost Canada in 1914 about...	45,000,000

Our fire fighting appliances are excellent. It is in other branches of prevention that we fail.

I conclude by expressing the opinion that we have had a year of satisfactory and progressive work. New fields of usefulness are continually opening up and old fields present continually varying phases of usefulness and interest.

The subject committed to our charge is so vast in its ramifications that we are oppressed only with the difficulty of deciding upon which objects attention can be most usefully directed.

DISCUSSION

DR. GEORGE BRYCE: It is always, of course, correct to have a hopeful and cheerful account of what has been accomplished during the past year; and our work for the year has been successful.

Yet, when we think of one or two things that have impressed themselves on our attention, we feel that there is still much left undone. As the Chairman has said, it has been impressed on my mind during the past year that, while we make very good resolutions and carry out all that we intend to do, yet, at the same time, we are not meeting the problem of the preservation of our timber and of protection against fire. These two matters are extremely important. A gentleman told me recently that while in Saskatchewan during the harvest season, they put out six fires in the fields that were being reaped, caused by sparks from railway engines. That is not in a wooded country, but in the open. In the autumn everything is very dry. He said to me: "We might have let the fires go and sent in our application for damages from the railway company—we might have done that but we did not; we put out these incipient fires, any one of which might have destroyed the whole field of grain."

We are not doing very much in regard to the protection of pulpwood. A leading lumber dealer, travelling between Toronto and Winnipeg, said to me: "If we could protect this growing white spruce which we see from the trains, we could have timber on that land that would be valued at \$40 an acre in about 10 or 15 years." I think he was rather optimistic in regard to the number of years. It seems to me we are not accomplishing some of these pressing things. We have been frightened by what has taken place in northern Ontario. I do not believe you will ever protect from fire the fields of the west until you get something like liquid fuel. The fields close to the railroad lines are in constant danger at harvest time.

While as a Commission we have done much work, there is a great deal more of practical work for us to do. There is the terrible rust, which has affected the crops in western Canada, especially in Manitoba and Saskatchewan. In those two provinces the fields looked beautiful, but the rust came on so suddenly, with very warm weather, that the yield was cut down by half. In the old days in our natural science work, we were told there was but one host for the rust, the barberry. I fear there are a great many more hosts, however; the pine and other trees probably harbour the rust, and, when you have a warm period, as you sometimes have in the west, for two weeks, there is great danger of rust. The Chairman feels as I do, judging from the way he has expressed himself. Apparently he, too, feels that, while we have done a great deal,

theoretically, there is much to be done practically, particularly in the matter of agriculture. I believe that is the great thing we should do now. While I have no remedies to suggest for the things I have mentioned, the great work for us to do is to protect the farm products, the fields of the farmer, and the growth particularly, of the white spruce. We have a great asset in the white spruce. I was once in Madison, Wisconsin, where the American institution for the study of wood products is situated. There I found a young Canadian of my acquaintance engaged in trying to take the red colour out of some of the pulp of coniferous trees, in order to make a satisfactory pulp. They feel that Canada has a monopoly of the white spruce for pulp-wood, and while they were working at the problem of removing the red from these other trees, they had not succeeded in doing so. This young man said, with a kind of chuckle, because he was a Canadian: "Well, we have got it all. We are here trying to take the red colour out of these trees, but we have the white pulp wood in Canada." He was rather amused. We were both Canadians, and were rather pleased to think we had this great monopoly. But, of course, it is reported that forty per cent of the pulp goes down the drain, and is not properly looked after. It is lost in the process of manufacture.

SENATOR EDWARDS: There is a greater recovery being made now; there is a very great improvement in that respect.

DR. GEORGE BRYCE: I am glad of it but I know our Dominion Technical Education Commission found that to be the case, three years ago. These are things to which we should devote constant attention. The greatest thing that we can do, it seems to me, is to protect our forests and the products of the forest.

SENATOR EDWARDS: We have one of the chief founders of the Commission of Conservation here, the Hon. Sydney Fisher. I think those present would like to hear from him.

HON. SYDNEY FISHER: I think you have paid me, perhaps, the greatest compliment I have had in my public life. If I am charged with being one of the fathers of this Conservation Commission, I confess and will plead guilty. The Chairman, Sir Clifford Sifton, has touched upon the entire work of the Commission, and there are only one or two particular points on which I wish to say a word or two. In the first place, I find, in my investigations into all sorts of economic subjects in Canada,—and lately, since I have been out of public life, I have been devoting more attention to

these matters—a great lack of exact information, a great lack of reliable statistics. It is true we have the Census and Statistics Bureau, which has been doing a great deal, and which has been placed, during recent years, upon a permanent basis. Our original statistics were just those secured by the ten-year census, and generally an almost entirely new staff was appointed for the purpose of taking the census. A permanent Bureau of Statistics was established some years ago, and is now carrying on the work. It is, however, hampered by two things. In the first place, there is a good deal of what I may call Provincial statistics, and then there is a great deal of what ought to be Dominion statistics, that are Dominion-wide in their nature. One department does not wish to encroach upon the work of the other department. I think, however, that a co-ordination could, and ought to be brought about to a greater extent than has yet been the case. The securing of statistics in Canada is comparatively in its infancy. We have a most able and competent gentleman in charge of that department today, Mr. Coates, and I know he is anxious, most anxious, to enlarge the scope of his duties and to work out the statistics of which we are in need for the proper study of our economic questions. I do not blame anybody in any way whatever; progress has been made; but, today, one of the most crying needs in the Dominion of Canada, and especially in view of the necessity of the application of scientific principles in the near future to all our economic questions, is statistics; and I hope that greater attention will be paid to this question, and greater facilities given for the collection of this absolutely necessary information.

There is another point that has been brought out, namely, the question of our agriculture. You, Mr. Edwards, and Sir Clifford Sifton, also, in his address, have talked about that being the most important basic industry of Canada. Everybody talks that way, but I am not quite sure that everybody realizes that fact or acts in accordance with that opinion. As a matter of fact, in the last fifteen years or so, agriculture has gone behind in its comparative development in Canada. I do not say it has gone behind actually. It has not gone behind actually in many ways although in some ways it has even done that. But, in comparison to the other developments of the country during the last fifteen years, there is no doubt that agriculture has taken a lower and lower position in Canadian development and Canadian enterprise. This I believe to be the most serious feature of our economic situation. You spoke about our natural resources. You said that they had been exaggerated in the past, and that they are being exaggerated today.

I think, however, that you quite rightly excepted our agricultural resources. There is no doubt in my mind that there is in Canada an almost illimitable agricultural resource in the fertility of our farms, in our area of good soil, in our temperate climate, suitable for the growing of all the best kinds of food, in our pure and abundant water, and in the opportunities for the development of our natural resources. The point is, however, that the thought and mind and capital and labour of our population are leaving agriculture and going into everything else. This must be changed in the near future if Canada is going to be able to meet the burdens which she is assuming in this war. These burdens are enormous. We cannot meet them by swapping jack-knives. We cannot meet them with the ordinary processes of trade. We must meet them by the increased production of basic products, which are necessary for the carrying on of the life of the various interests of the community; and in Canada today the production of the products of the soils and the production of food, whether for the use of the country itself or for export to pay our bills abroad, is essential to our prosperity in the future. When I tell you, what is an actual fact, that, to-day, there are fewer domestic animals in Canada than there were fifteen years ago, you will realize the gravity of the situation. Our sheep industry has gone down steadily and very largely. There are fewer cows in Ontario and Quebec than there were fifteen years ago, but they are individually doing a little better work, and, consequently, our dairy production has not decreased as much as it would have decreased were the production of the individual cow the same as it was fifteen years ago. But, at the same time, there are actually fewer horned cattle today in Canada than there were fifteen years ago. The trade in these things has been decreasing comparatively to the whole of our trade. The trade in agricultural products has been steadily decreasing. We used to be an exporting country of all agricultural products. But, until the extreme stimulus of the war, we had ceased to be an exporter of butter; that is to say, we imported more butter than we exported. For some years past we imported more eggs than we exported. We have ceased to export poultry meat, which a few years ago we exported. The advancement made in our export of food products has been entirely due to the enormous increase in production of wheat and the export of wheat and its products from Canada; that of course would not have taken place but for the development of our Northwest. Speaking particularly of eastern Canada, we are rapidly approaching the period when Canada will cease to be a food-exporting country. When you reflect on and realize the enormous interests of agriculture

in this country, you will appreciate the serious situation. The reasons for this are two-fold: In the first place, practically all capital has been attracted into other industries—other lines of production. Practically all labour has been attracted away from the farm, into the cities and into the great construction works that have been going on in the country; and I know to-day hundreds of farms which, say fifteen years ago, had two or three labourers on them, besides the owner, but which, to-day, have none, because the owner cannot get them. The wages paid in the great construction works of the country and in city employments are such that the farmers have not felt that they could compete; the result has been that the men have left the farms and gone into these other occupations. It is an actual fact that comparison between the census of 1901 and that of 1911 shows less hand labour put upon the farms of eastern Canada per hundred acres in 1911 than in 1901. The only grain crop in Ontario, Quebec or the Maritime Provinces which increased between these two periods, was buckwheat—and anybody who knows anything about farming knows that the growing of large quantities of buckwheat is not considered particularly good agriculture. The only other crop which increased was hay. Land which, twenty years ago, was cultivated, worked, and used to grow crops, was turned into meadow land; that meant less labour was needed, and less was applied; and the cause we know—that the rural population has been decreasing steadily during the last fifteen years in proportion to the whole population of the country. In 1901 the rural population was 62%, as against 38% of urban population; in 1911 the rural population was only 54%, as against 46% of urban population. And I venture to say that, to-day, the rural population of Canada is not more than one-half the total population of the Dominion. This is a serious situation—a situation that must be dealt with and studied, and for which some remedy has to be found if, in the near future, Canada is to meet her obligations and to develop and produce what is necessary to feed her population and to pay her debts.

I shall not go into the necessary remedies; they are complex and difficult to work out, but the main remedy, and the one that may come about by the natural course of procedure, is that agriculture must be made more profitable; the returns must be more in proportion to the returns from other industries in the country, it must be more profitable so that capital will go into it; more profitable so that labour will go into it, and, with that, a better application of brains for business management, which have been applied so successfully to other businesses. The brain has been steadily drawn

away from the farm for the last twenty years so that to-day Canada has not available for agricultural work as large a proportion of skilled managers as for other industries. Efficient business management is needed in agriculture if in anything, and, to-day, when we have large quantities of capital in our banks and elsewhere in the country, when we have brains everywhere in Canada applied to the best of their ability to all sorts of things, we must ask that capital and brains turn to agriculture, and release this country from a very serious matter in the near future.

SENATOR EDWARDS: Yesterday, I received a report which may be of interest at this juncture. I do not contend that what has been accomplished here will be accomplished every year; but, if the same method that was applied here, is applied to all Canada, I have no doubt as to the enormous saving that would result in so far as our forests are concerned. Some five years ago, a protective association was organized to protect the forests on the watershed of the St. Maurice river, in the province of Quebec. Two years ago, a similar protective association was organized for the Gatineau, Lievre and Rouge watersheds. The Association first operated in 1914. In that year, they had 290,000 acres burned over and 15,000,000 feet of lumber destroyed. In 1915, 14,558 acres were burned over and only 6,000,000 feet of lumber were destroyed; in 1916, they had only 3,617 acres burned over and 455,000 feet of lumber destroyed. I do not mean to say that such tremendous results can always be secured. Accident might have brought about different results; but it is unquestionable, that the application of the means which have been adopted on the St. Maurice, if applied to all Canada, would effect a saving much in excess of our annual expenditure for the administration of the forests of Canada. I think this will be very gratifying to our friend, Rev. Dr. Bryce, who very properly referred to the destruction of our timber by fire.

The Use Of Commercial Fertilizers

BY

H. J. WHEELER, PH.D., D.Sc.

*Late Director of the Rhode Island Agricultural
Experiment Station*

MR. Chairman and Gentlemen: There is good reason why I feel a special interest in your conservation work, because for a few years I served as a member of the State Conservation Commission of Rhode Island. During that time we made a complete survey of the land in Rhode Island, taking special note of areas which had been deforested, but which should have been kept as forest lands. I was particularly impressed with the fact that, in Canada, you have been allowing settlers to clear land which is unfit for tillage, and which should, therefore, be reforested. It has seemed to me as though I were hearing the past history of New England reviewed while sitting here this morning listening to the stories of waste and of your agricultural conditions.

I have been particularly impressed by the remarks about your coal resources, for Germany is reported to have forbidden the use of any soft coal until it has been coked, so that all the ammonia and other by-products may be saved. We, in the United States, have been and are still sinfully wasteful in this respect. We ought to save every ounce of ammonia in coal. It is a national crime to allow this ammonia to pass off into the atmosphere and be lost forever.

The references to the conservation of your water-powers interest me, for the reason that in the United States we now have a Bill before Congress which, if adopted, will practically give to private interests, forever, all the power of certain navigable streams. If I am not mistaken, the power which it is proposed to give away would amount to more than all the power developed in the United States at the present time from all other sources.

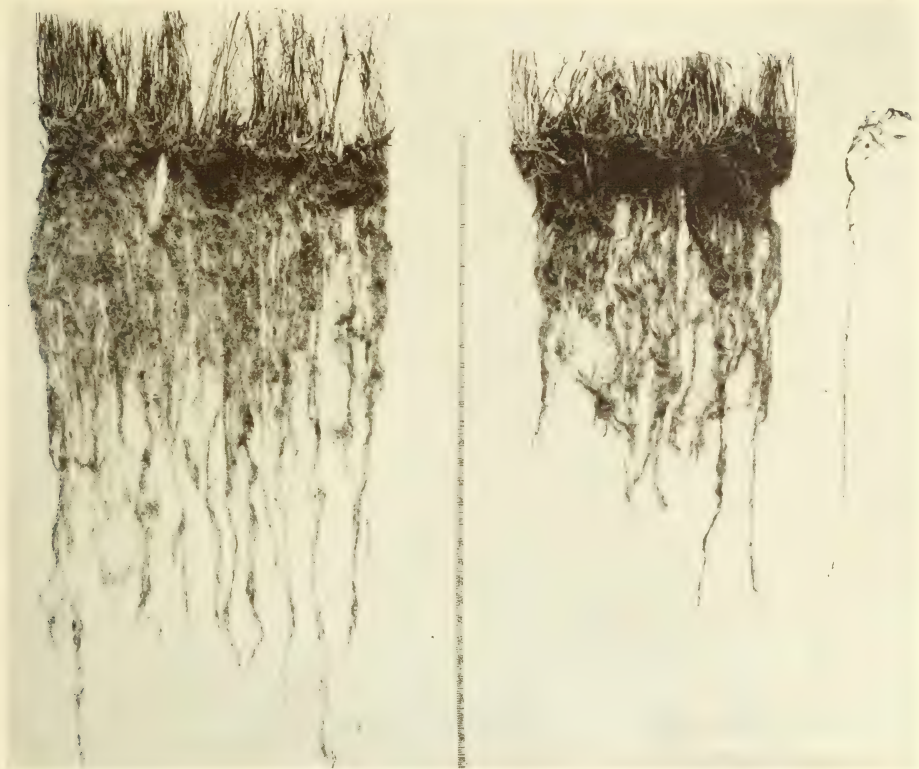
First, I will speak briefly of some of the elementary matters connected with the subject of fertilizers before proceeding with my paper.

Requirements
for Plant
Growth

Plant growth is dependent upon the ten elements, nitrogen, phosphorus, sulphur, carbon, hydrogen, oxygen, potassium, calcium, magnesium and iron.

Of these, iron, sulphur, magnesium, calcium, potassium, phosphorus, and most of the nitrogen come from the soil, hydrogen and oxygen from water and carbon and oxygen from the carbonic

Photos. by courtesy Agricultural Service Bureau of the American Agricultural Chemical Co.



GRASS ROOTS, FERTILIZED AND UNFERTILIZED

At left from one square foot, three feet deep, fertilized section. At right from one square foot, three feet deep, unfertilized.



CORN, FERTILIZED AND UNFERTILIZED

Left, fertilized 90 to 100 lbs. to the acre. Right, unfertilized. The gain from the use of fertilizer amounted to 10 bushels to the acre.

acid gas absorbed from the air by the leaves. The legumes, for instance, and also a few other plants, may take nitrogen from the air, nevertheless a considerable part of what they contain is taken up in combined form from the soil. Nitrogen, phosphoric acid and potash are the three plant foods (or, as the botanists would say, "ingredients of plant food") which are most likely to become deficient in the soil. Sulphur may also become deficient, although this is not usually the case. For instance, on our western coast there are soils well supplied with lime on which wonderful results have been secured by the use of gypsum or land plaster (sulphate of lime). It is evident, in such a case, that the results could not be due to need of lime but rather a lack of sufficient sulphur. In the course of my experiments in Rhode Island I found soils in which magnesia was deficient, and, in Porto Rico and elsewhere, even iron is needed. In Hawaii, for instance, it is necessary, on some soils, to spray the pineapples with iron in order to supply them enough of this element so that they can be grown successfully on soils rich in manganese.

Various materials are employed to furnish the necessary nitrogen, potash and phosphoric acid. Our supply of nitrogen comes chiefly from the nitrates, such as nitrate of soda, nitrate of potash and nitrate of lime (the latter now being made in Norway), calcium cyanamide, sulphate of ammonia and various organic substances, such as fish, tankage, blood, hair, wool waste, cottonseed meal and similar materials. If nitrates are applied exclusively to land which is light and open, they are subject to more or less loss by leaching, for they are not held in chemical combination in the soil. This is why they must be used with great care on sandy soil. Ammonia in sulphate of ammonia, on the contrary, combines with the soil chemically, and thus it has a distinct advantage on light soils. It is nevertheless readily changed into nitrates, and some of it may even be absorbed by certain plants without undergoing this change. A few years ago, however, this was not supposed to be true.

Probably the best organic form in which nitrogen can be secured is dried blood, but the total quantity available is very small. Next, perhaps, in rank are fish-waste and tankage. Then follow a large number of nitrogen sources, the waste from various seeds after removal of the oil, seaweeds, wool waste, hair, felt, feathers, leather and similar organic materials. It has now been ascertained that plants may even take up and utilize some nitrogenous organic substances without their being first transformed into ammonia or nitric acid, provided they are first decomposed into sufficiently small molecules, such as acid amines and amino acids.

Potash is present in considerable quantities in wood ashes and seaweeds but the chief supply is usually secured in potash salts, such as muriate of potash, sulphate of potash and kainite.

This, briefly, covers the general question of fertlitzer materials, although to treat of them fully would involve several hundred printed pages. I will now suggest for your consideration the desirability of admitting mixed fertilizers to Canada free of duty and will proceed with the presentation of my formal paper.

Importance of Fertilizers

Before it can be expected that a nation will awaken to the full importance of the use of fertilizers, it must first be aroused to the fact that agriculture is the great industry which underlies all others. In the United States, until about 1900, or shortly thereafter, it seemed as if the merchant, the manufacturer, the banker, and, above all, the politician, had forgotten this most important fact connected with our own national economy. To be sure, we had our experiment stations and our rapidly growing Department of Agriculture, but the people of the United States, as a whole, were only beginning to awaken to the great importance of agriculture. Since that time the situation has changed, and, today, it is a rare occurrence if, at a meeting of bankers, manufacturers, merchants, chambers of commerce, or other large bodies of men, agriculture is not held up as the one great national industry which must be fostered to the utmost, for the reason that all others depend, directly or indirectly, upon it.

Recently a representative of one of the largest banking establishments of the United States, in speaking before the Boston Chamber of Commerce, stated that the value of all of the gold taken out of California, from the time it was discovered in 1849 to the present, represented only three-fourths of the value of the cotton crop of the United States for 1916. He impressed upon his audience, in the strongest manner possible, the fact that, above everything else, a nation must encourage its agriculture to the very utmost.

In a new country which is just being developed, the natural tendency is to devote a large part of the land to grazing; but, as the population increases and the demand for human food becomes greater, a more intensive form of agriculture, involving the tilling of the soil, becomes a national necessity. When these grazing lands, unusually enriched by the vegetable accumulations of untold centuries, are first brought under the plough, there is little need of additional plant food, and crops can be produced so abundantly and cheaply that the use of fertilizers would be uneconomical. Usually, however, farmers continue cropping in the same manner

many years longer than they should, with the result that the land becomes greatly deficient in one or more of the essential plant foods.

In much of the eastern part of the United States fertilizers are needed as soon as cultivation commences. There are today few, if any, lands in the eastern part of the United States which do not need fertilizer, and this is doubtless true, or becoming true, of most of the land in eastern Canada.

Proportion of
Land Cultivated

It is an interesting fact that in England and Wales, in the period from 1905 to 1914, 40·8 per cent of the land was in pasture, whereas in Germany only

3·2 per cent was devoted to such uses. In England and Wales 69 acres in every 100 were in grass and clover, whereas in Germany the number of acres devoted to these crops was only 32 in every 100.

During the latter part of the preceding century, Germany, like England and Wales, was driven, as a result of competition with cheap cereals from the United States, Argentina and Russia, to the necessity of devoting extensive areas to pasture and grass. In England and Wales the situation has remained practically unchanged, whereas Germany had but 3·2 per cent of land in pasture in 1913.

It is interesting to note some of the factors which brought about this remarkable change in Germany. To be sure, the increased import duty on grain exercised a certain effect. Better distribution of labour was brought about by reforestation woodland unfit for tillage, thus giving more employment to rural labour in winter in the cutting of wood and in lumbering operations.

In Germany, 93 per cent of the farm land is owned by the operators. Such men are more ready to use fertilizers and improved implements than tenants. In England and Wales, on the contrary, only 11 per cent of the farm land is operated by the owners.

In England and Wales, but relatively few of the men conducting agricultural operations have received adequate agricultural training. It is especially deplorable that agricultural education and agricultural extension should have been neglected in the past in the country which has led the world in agricultural research by means of the splendid work of the late Sir John B. Lawes and Dr. Gilbert, Drs. Warington, Dyer and Voelcker, and, more recently, by that of Drs. Hall, Middleton, Russell, Voelcker and their colleagues and associates.

Germany also introduced the sugar beet industry, recognizing that an acre devoted to sugar beets will produce four times the food value of an acre devoted to rye, twice the food value of an acre devoted to potatoes, and, furthermore, that the manufacture of

sugar affords labour for the rural population during three or four of the winter months. The sugar beet is a crop which must be highly fertilized, and in consequence the yields of succeeding cereals and other crops are greatly increased.

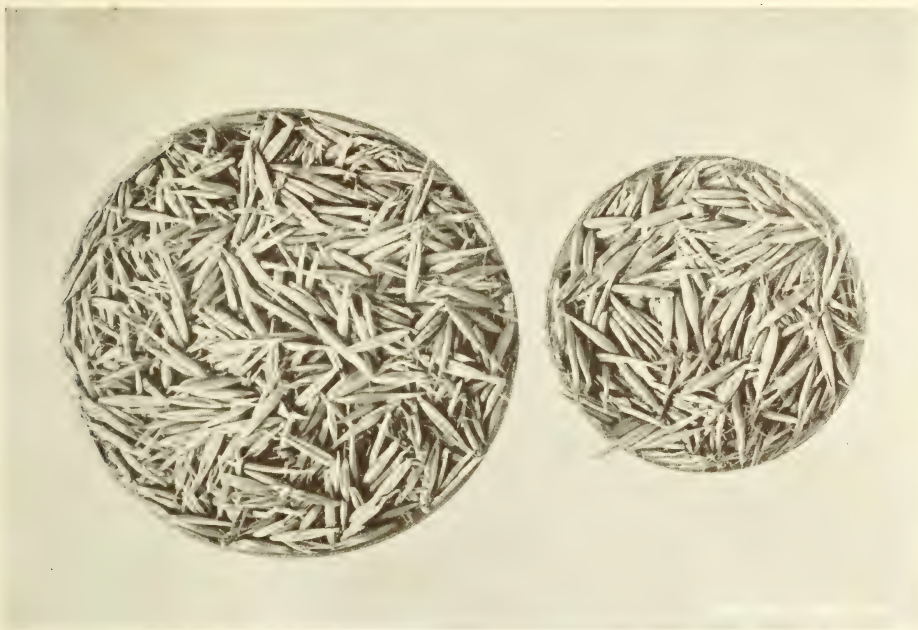
Potato Growing The potato industry has been developed in Germany until, on her 82,000,000 acres of tillable land, she is producing nearly 4.5 times as many bushels of potatoes as the entire United States on its 478.4 millions of acres and 3.5 times as many as the United States and Canada combined. The manufacture of these, in the winter months, into starch, alcohol, potato chips, potato flakes, potato flour and dried potatoes, for general feeding or industrial purposes, likewise affords occupation for the rural labour during the months when it would otherwise be difficult to keep the workmen near or on the farm. The potato crop is one which requires high fertilization, and which, in consequence, leaves the land enriched for the crops which follow. The production of these large quantities of potatoes insures a large amount of excellent food for swine, the farm animal which produces most for what it eats, and the feeding and killing of them also affords employment for farm labour.

I will not take time to mention the political organizations, the enormous development of co-operative marketing and buying organizations, or the creation of official chambers of agriculture and co-operative credit associations, but too much emphasis cannot be laid upon the important bearing of general agricultural education in connection with the development of German agriculture, in which the extensive use of fertilizers has played a most important part.

A careful study of German agricultural statistics reveals the fact that there has been a very large increase in crop production in recent years, and Prof. Von Seelhorst, of Göttingen, attributes one-half of this increase to the use of fertilizers and the other half to better tillage, selected seed and proper rotation. Prof. Schneidewind, of the University of Halle, states that, as a means of bringing about this improvement, the use of fertilizer takes first rank. Similar testimony is also given by Prof. Gerlach, of Breslau.

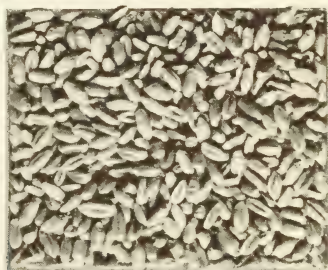
In considering the possibility of the profitable use of fertilizers, certain factors are of vital importance. I refer first to land drainage. In England and Wales drainage has been neglected somewhat in recent years. In the United States it is estimated that 200,000,000 acres of the land now being tilled are in need of drainage, and no doubt there are similar large areas in Canada. It is stated that one-tenth of the tilled land in the best corn state in the United States is in

Photos. by courtesy Agricultural Service Bureau of the American Agricultural Chemical Co.



OATS, FERTILIZED AND UNFERTILIZED

Left, fertilized 240 pounds to the acre; Yield 62.2 bushels to the acre. Right, unfertilized; Yield, 30.7 bushels to the acre.



WINTER WHEAT, UNFERTILIZED AND FERTILIZED

Upper, unfertilized; Yield 8 bushels to the acre. Lower, fertilized 200 pounds to the acre: Yield 19.5 bushels to the acre.
The fertilized wheat sold at \$1.00 per bushel and the unfertilized at 70 cents.

need of drainage, and that in several of the great corn-producing states, 90 per cent of the land is in need of such improvement. Crops cannot be grown successfully, either by the use of farm manures or fertilizer, if they must stand with their feet in water or are subjected to periodical or occasional overflow during the growing season. If you or I owned or were solely responsible for the United States or Canada, one of our first steps would be to provide a comprehensive system of drainage for all lands suitable for general agricultural purposes which are now being tilled.

**Need of
Drainage** In many of our own states we have laws under which counties may lay out systems of drainage and assess a special tax upon those who are benefited, but the people are slow to take the initiative, and, as a gentleman remarked recently in discussing the community life of various organizations which have sprung up in the United States from time to time, there must be an intelligent, aggressive, persistent head or such projects result in failure.

Whatever objection may be advanced to centralized power and paternal government, if there is not centralization and the exercise of paternalism in matters of this character, they do not receive proper attention, to the great detriment of the entire nation.

In the United States the next great factor limiting the possibilities of crop production by the use of fertilizers is probably the need of lime, and in this particular we are but just awakening to its enormous significance. Public attention was first called to the widespread existence of acid upland soils in the United States in the years from 1893 to 1895. Nevertheless, in 1900 only 520 tons of lime were sold for agricultural purposes in the entire United States. Statistics show that in 1912 the quantity sold for such uses amounted to 604,607 tons, and it had an estimated value of \$1,152,520. It is probably safe to estimate that, by 1920, several millions of tons of lime a year will be sold for agricultural use.

It is estimated that there are 20,000,000 acres of land in immediate need of lime in twenty states in the South, East and Middle West, besides extensive areas on the western coast, but even this estimate is doubtless far too low. None of these lands will yield full returns from the use of commercial fertilizers until this need is supplied.

It is of the utmost importance, therefore, in connection with the use of fertilizer in Canada, that the areas of acid soils be definitely determined, and that steps be taken to insure a reasonable and proper use of lime as a basis for securing the greatest returns from the use of commercial fertilizer. The importance of having the use of

fertilizers and lime go hand in hand is not properly recognized.

The value of lime for agricultural purposes was known to the ancients. They likewise knew the manurial value of animal manures, legumes and, doubtless, of a few other substances.

In earlier times it was found that repeated liming without employing manure in conjunction with it resulted in greatly increased crops for a time, but after depleting the more available plant food of the soil, the crops finally became less than before it was used. This fact gave rise to the old sayings:

"Lime and lime *without manure* will make both land and farmer poor."

"Lime enriches the father but impoverishes the sons."

What is true of the use of lime without manure also applies when it is used without fertilizer, for fertilizer contains in concentrated form the plant food elements which are present in far smaller quantities in manures. It is, therefore, important that limed land should be suitably fertilized and, conversely, that quite acid soils which are manured or fertilized should also be limed. This idea is very well expressed by Barker and Collison of the New York (Geneva) Agricultural Experiment Station, who say:

"When the use of lime in any form is continued alone and no adequate provision made for maintaining the supply of other fertilizers and organic matter, crop yields cannot be kept up, and the returns from the use of lime in such a system become less and may finally drop below that of land unlimed."

In speaking of lime and its effects Aikman, the well-known English authority, says:

"It is conceded that the crops we grow rob the soil of organic and inorganic matter. A double crop will take twice as much, a triple crop three times as much and so on. And the more we take out in one year, the more rapidly will the land be exhausted. * * * But we can restore to the soil what crops carry off — and this is the function of manures and fertilizers."

It has been appropriately said by Frear of the Pennsylvania Agricultural Experiment Station in discussing the use of lime that:

"Many a farmer has wastefully limed the acid soil of a run-down farm because he did not also drain and well till his soil, sow good seed, and feed his crop."

The same author adds:

"* * * the farmer who limes needs to keep up his humus supply."

In fact, the maintenance of a good supply of both lime and humus insures the best results from the use of fertilizers.

In Bulletin No. 187 of the Virginia Agricultural Experiment Station it is stated that:

"Liming should be but one feature in a general plan of soil improvement."

The facts concerning liming are set forth in Bulletin No. 160 of the Vermont Agricultural Experiment Station as follows:

"Nitrogen, phosphoric acid and potash are deficient elements or compounds of plant food. The supply thereof gets low when soils are heavily cropped and plants become hungry for them. That is why they enter into the composition of commercial fertilizers, why materials containing them in available forms constitute the so-called 'direct' or 'nutritive' fertilizers. Lime, on the contrary, while sometimes needed to supply a soil deficiency of that material, is more apt to be of service on account of its indirect action."

In Circular No. 28 of the North Carolina Agricultural Experiment Station the use of lime is discussed as follows:

"Because of a misconception as to its action, there is much misuse of lime by a goodly number of farmers. In many cases where marked results have followed its use, the conclusion has been drawn that it is the only material that needs to be added to the soil in order to secure large annual yields thereafter. Such a conclusion is not justified by the facts in the case, and if lime is used and depended upon entirely, it will be found in time that the beneficial results will gradually grow less. There is no truer saying than that the indiscriminate use of lime enriches the father but beggars the son, that is if on the average soil it is depended upon solely. It should be remembered that, although lime is an essential for plant growth, as is phosphoric acid, nitrogen, and potash, it is not able to replace any one of these latter three nutrients in the promotion of plant development."

In Bulletin No. 80 of the Canadian Department of Agriculture, Dr. F. T. Shutt, in speaking of lime compounds, says:

"It is true they may serve a useful purpose in some soils by furnishing available lime, but they do not add to the soil's store of nitrogen, phosphoric acid and potash the essential elements that must be constantly returned if the soil's fertility is to be maintained or increased."

The situation concerning lime is very clearly set forth in Circular No. 33 of the Agricultural Experiment Station of Purdue University, Indiana, in which it is stated that:

"The production of larger crops by any means except direct fertilization, no matter whether it be by superior tillage, by the growth of more prolific varieties, or by the use of lime, necessitates the use of larger amounts of manure, clover and fertilizer, to maintain the balance of income and outgo of plant food, and in this fact lies the truth of the old saying, 'Lime and lime without manure, makes both farm and farmer poor.' Lime

is not a fertilizer in the commonly accepted sense, as it contains neither nitrogen, phosphoric acid nor potash, so it naturally follows that dependence upon lime alone must soon result in a shortage of one or more of these elements."

Lyon, Fippin and Buckman, in their recent work on soils, say that:

"Certain substances are sometimes added to soils for the purpose of increasing productiveness through their influence on the physical structure of the soil, and thereby on the chemical and bacteriological properties. These substances are called soil amendments. It is true that they may add essential plant ingredients to the soil, but that function is of minor importance."

At the Pennsylvania Agricultural Experiment Station (Bulletin No. 131) Gardner made very careful tests with fertilizer and lime, in pot experiments, under such conditions that the moisture and other factors were uniform. He found that the yield of green clover from two pots without lime and fertilizer was 29 grams, with ground limestone it was 33 grams, with complete fertilizer but no ground limestone it was 43 grams, and with fertilizer and ground limestone, 48 grams.

On page 180 of the same bulletin other results are given. For example, without fertilizer and lime the yield of green clover was 12 grams, with lime it was 14 grams, with fertilizer but without lime it was 39 grams, and with both fertilizer and lime it was 52 grams. These results also show the advantage of using both lime and fertilizer.

The N.Y. (Geneva) Agricultural Experiment Station, in Bulletin No. 400, mentions the experiments in Ohio and states that in one round of a four-year rotation the increase in the value of the crops from lime and acid phosphate when used on separate areas was \$38.58 per acre, but when the two were used together, the total gain in crop amounted to \$40.83; similarly when lime in one case and phosphoric acid and potash in the other were used separately, the total increase amounted to \$49.15, but when all three materials were used together, the value of the increase was \$54.28. The total value of the increase in crop when lime and complete fertilizer were used separately was \$57.19, but when the two were used together the value of the increase was \$61.22. Likewise, lime and manure (16 tons to the acre) when used separately gave a total increase in crop amounting to \$77.08, but when used together under the same conditions the total gain in crop was \$81.53. If lime is used alone, without adequate provision being made for supplying the necessary fertilizer ingredients and organic matter, the crop yields cannot be properly maintained. Under such a system yields may be expected to drop finally below those on unlimed land.

It is stated in Bulletin No. 279 of the Ohio Agricultural Experiment Station that:

"The experiments reported in this bulletin show that on soils deficient in lime it is as necessary to make good this deficiency as it may be to make good that of nitrogen, phosphorus or potassium. They show, moreover, that lime does not take the place of other fertilizing elements, but only accomplishes its full effect when used in connection with liberal manuring or fertilizing."

In Circular No. 144 of the same station it is stated that:

"So far, therefore, as the results of this experiment may be accepted, they support other experiments of this station in showing that ground limestone should be used only as a supplement to liberal manuring or fertilizing, * * * " and not "as a substitute for manure or fertilizers."

In Indiana the following financial returns from the use of fertilizer were secured and are given in Bulletin No. 260, page 435:

Crop	Limed but unfertilized	Complete fertilizer and lime
Corn.....	\$12.46	\$19.22
Oats.....	11.14	15.30
Wheat.....	7.54	17.81
Clover.....	9.53	14.01
Timothy.....	7.24	9.05
Total value	47.91	75.39
Cost of fertilizer		\$15.03
Cost of lime	\$6.00	6.00
	6.00	21.03
Balance.....	41.91	54.36

From this table it will be seen that the *net gain* was \$12.45 greater per acre when both lime and fertilizer were used than when lime was used alone. The authors of this bulletin make the following comments concerning this work:

" * * * the land needs not only phosphorus, potassium and nitrogen, but lime also; the need for lime, so far as the clover crop is concerned, being even more urgent than that for phosphorus. Consequently, the combination of phosphorus and lime is more effective than larger applications of phosphorus without lime." * * *

"But clover cannot be grown successfully on a soil deficient in lime and on thousands of acres in eastern Ohio clover is making a weak and sickly growth, or is failing altogether,

because of this deficiency; and as clover fails the yields of other crops become more irregular. Lime, therefore, is the foundation of soil fertility, but it is only the foundation. Indirectly, lime increases the nitrogen supply through clover, but it adds neither phosphorus nor potassium. After the foundation is laid, then these become necessary to the superstructure. All are required to complete the edifice, each supplementing and reinforcing the others."

In Bulletin No. 159 of the Ohio Station the following results are given:

Average Number of Bushels of Corn to the Acre for Four Years

Neither lime nor fertilizer	Lime	Complete fertilizer	Lime and complete fertilizer
30.4	38.2	53.5	61.0
29.5	40.1	48.7	59.3
29.5	40.1	55.3	63.9
28.1	38.5	49.0	63.5
28.1	38.5	36.3	46.4
26.9	36.7	48.2	59.9
26.9	36.7	49.3	60.1
32.4	41.3	48.3	63.6
32.4	41.3	53.1	60.9
33.0	39.3	54.6	61.1

It will be seen that in every case the yield with lime and complete fertilizer was greater than with either one when used alone.

Similar yields of clover hay are given in the same bulletin and these show that the yield with neither lime nor fertilizer was 1,061 lbs. to the acre, with lime 1,981 lbs., with fertilizer alone 2,542 lbs., and with lime and complete fertilizer 3,712 lbs.

Tests made in Illinois on the Sibley field for a period of ten years show that the value of crops without fertilizer or lime was \$147, where lime was used the value amounted to \$159, whereas with lime and complete fertilizer the value was \$227.

On the Bloomington field a similar total value for a period of ten years without lime amounted to \$148, with lime it was \$149, and with lime and complete fertilizer, it was \$226.

In Bulletin No. 163 of the Rhode Island Agricultural Experiment Station in which is given a general review of the work done there from 1894 to 1913 with phosphates and lime, it is shown that lime gave an increase in crops for that period valued at \$395 per acre, the increase from fertilizer without lime was \$440, and when lime and fertilizer were both used, the increase amounted to \$882.

These results and conclusions show that lime and fertilizer should be used on the same land if the soil is very acid. If it is not acid and is in need of flocculation, the same is true. If it is not too acid and is in proper physical condition, fertilizer is all that is needed.

Doubtless other conditions prevail locally in Canada to interfere with the securing of the best results from the plant food which is applied to soils, and, wherever such difficulty is experienced, the aid of Dr. Shutt and your other agricultural chemists must be invoked to solve the problem.

By way of illustration, it has been found that in certain Hawaiian soils there is such a high percentage of manganese and such a low percentage of iron that adequate returns from fertilizer and the economic production of pineapples is impossible until the crop is sprayed with an iron salt, and this is now being done over large areas with economic success. In connection with the treatment of certain soils in Florida and elsewhere, it has been found that excessive liming must be studiously avoided, for otherwise the iron compounds in the soil are rendered insoluble to such a degree that the plants cannot secure as much iron as they need, and yellowing, or chlorosis, results. Under such conditions fertilizers cannot perform their proper function.

Humus must be
Maintained

In addition to the need of drainage and liming, too much emphasis cannot be placed upon the necessity of maintaining a proper supply of humus or organic matter, also upon the need of thorough preparation of the soil, and the importance of recognizing the widely different soil and plant food requirements of different crops.

It is often of great importance that the fertilizer be applied at the right time. Winter grain, for example, requires that a sufficient quantity should be used at the time of seeding to enable the plants to become well established before the advent of winter. When top-dressing either cereals or grass in the spring, attention should be paid to whether the stand is sufficiently thick or too thin. If the latter is the case, the top-dressing should be applied early, in order to stimulate tillering or the formation of an increased number of stalks.

It is important, in the production of potatoes, that a considerable part of the fertilizer or all of it, if not used in large quantities, be applied in the drill at the time of planting. An exception may be made, however, in the case of extremely sandy soils where it is often desirable to apply some of the fertilizer subsequently, either close beside the rows at the first cultivation or on top of the rows just before the potato tops emerge from the ground.

The influence of the fertilizer or of lime on certain plant diseases, such as potato scab, finger-and-toe of the turnip and cabbage family, the root rot of tobacco, or the dry spot of oats, is often a matter of great importance.

With the exception of sandy soils, on which there is danger of leaching, and in the case of certain truck crops, fertilizer generally gives the best results when all of it is applied prior to planting. It is of the utmost importance in connection with many kinds of plants that the fertilizer should not come in immediate contact with the seed.

Crop Yields and
Fertilizer

It is interesting to note some of the crop yields in different countries in relation to the quantities of fertilizers employed. For example, the wheat crop of Germany in 1913 amounted to 35.1 bushels to the acre, in France to 19.9 bushels, and in the United States to 15.2 bushels. The oat crop of Germany amounted in the same year to 61.1 bushels to the acre, in France to 31.6 bushels, and in the United States to 29.2 bushels. In 1913, the potato crop of Germany averaged 235.8 bushels to the acre; France, 127.2 bushels; and the United States, 90.4 bushels. The average yield for Germany was about 10 bushels ahead of the average yield of Aroostook county, Maine, which leads all sections of the United States in yields. In this connection it should be remembered that Germany uses twice as much fertilizer to the acre as France, and she uses, on her area corresponding approximately to three-fourths of the state of Texas, about as much as is used in the entire United States.

Much has been written in certain parts of the United States about the so-called exhausted lands of New England, and it has even been stated that the use of fertilizers is responsible for the land being so poor. It is, therefore, of interest to note the fact that the lowest average yield of corn in any one of the New England states during the period from 1906 to 1915, inclusive, was 38.8 bushels to the acre. The lowest average for the same period in Connecticut, New York, New Jersey and Pennsylvania was 36.2 bushels to the acre. Bearing in mind that these were the lowest yields in any year of the ten, it should be noted that the average yield for the entire period of ten years for the state of Illinois was only 34.4 bushels to the acre, that of Iowa was the same, and the yield in Michigan was only 33.5 bushels to the acre. It will be seen, therefore, that the far poorer and so-called worn-out lands of New England are surpassing the best corn-lands of the United States in yield, and are even doing it with flint corn. This is true

Photos. by courtesy Agricultural Service Bureau of the American Agricultural Chemical Co.



POTATOES, FERTILIZED AND UNFERTILIZED

Left, fertilized; yield, 336 bushels large and 28 bushels culls to the acre. Right, unfertilized; yield, 193 bushels large and 33 bushels culls to the acre.



POTATOES ON FERTILIZED LAND, PRESQUE ISLE, MAINE, 1914

A remarkable yield, 660 bushels to the acre.

even of the states of Iowa and Illinois, the residents of one or both of which, until recently, have boasted that their soils were so rich that fertilizers were not needed. Furthermore, the value of the corn in the east is far greater than in those states.

During the same period, according to the United States census, the five New England states led the entire country in the production of potatoes. The average yield in Massachusetts was 116 bushels to the acre, Vermont 122 bushels, Rhode Island 127 bushels, New Hampshire 128 bushels and Maine 206 bushels, with Aroostook county leading the country with a yield of about 226 bushels to the acre. Yet in this famous county it is an exception to find land which will produce more than from 50 to 160 bushels to the acre without the use of fertilizer, even on land recently redeemed from the forest. If it had not been for the extensive use of fertilizers, that county would not have been known throughout the United States and in foreign countries as a great potato-producing region. It has been the fertilizer under the potatoes which has made the county prosperous and famous.

Special Crops and Climatic Conditions	In the production of tobacco, for wrapper and binder purposes, the character of the materials entering into the fertilizer is of great importance, since they are likely to affect the colour of the ash, the burning quality of the tobacco, and its texture.
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Fertilizers compounded for crops like potatoes, which are matured in a relatively short time, and which are grown in northern climates where the nights are cool, the days short, and the conditions for nitrification somewhat unfavourable, must be compounded differently from fertilizers designed for use in the south, where the temperature is high, the days long, and where the conditions for ammonification and nitrification are exceedingly favourable.

In growing a crop like cranberries, it is not so much a question of the proper proportion of plant foods which is used as it is the choice of materials entering into the composition of the fertilizer.

Obviously for the growth of sugar beets, hops, and still other crops designed for special purposes, the proper compounding of the fertilizers is of as great importance as any other feature.

DISCUSSION

MR. KIDD: What can the farmer afford to pay for lime for the ordinary sour or acid soil?

DR. WHEELER: The amount depends on the value of the crop and the degree of acidity and fertility of the soil. I have paid as

high as \$10 a ton for slaked lime and found it very profitable. That, of course, is only possible on a crop having a high money value and on a very acid soil.

As a fertilizer on wheat, corn, oat and potato crops, the farmer can afford to pay a good deal more than the lime ought to cost him. Ground limestone is being sold in New England at present for from about \$2 to \$2.50 f.o.b. in bulk, and the farmers can derive a handsome profit from its use. When it comes to burning, there is an additional expense, but, if it has to be hauled a long distance, the saving in hauling gives a certain advantage to the burned lime. While I have used it for a great many farm crops and have paid as high as \$10 a ton for it, one might not be able to afford to pay that price for wheat land.

MR. KIDD: Where I propose to build the kilns, the limestone will cost nothing, and, as there is wooded country in the neighborhood, it will be easy to get the wood to burn the lime. The ground to be covered is about two hundred miles.

DR. WHEELER: Why not grind the limestone? Ground limestone is a much safer form to use. If I may use the expression, it is "fool-proof." There is no danger of immediate harm from it, while slaked lime in considerable quantities, two tons to two and one-half tons to the acre on dry soil, may cause immediate injury to the crop.

If the land is low and in the spring is inundated and is acid, it probably needs lime, but the most economical results will not be secured until the inundations in the spring are stopped and until the land is properly drained.

HON. MR. FISHER: Is it advisable to put the lime on in the spring?

DR. WHEELER: Any time before the seeding or planting is done. I have many times put on lime in the spring immediately before the crop was put in, with good results. But it has to be thoroughly worked in. As a rule, immediately after the land is ploughed and harrowed once, the lime should be sown broadcast as evenly as possible, and worked in thoroughly with a disc harrow.

If the soil is somewhat acid lime will help the apple trees, and may also help pear and peach trees, at least indirectly, if used in small quantities. Quinces, cherries and plums respond markedly to liming on very acid soil.

HON. MR. FISHER: How much lime should be applied to ordinary sour land?

DR. WHEELER: In most cases two tons is a sufficient quantity with ordinary crops. Alfalfa sometimes needs three to four tons. Sometimes one ton is sufficient. The proper plan is to have the soil tested and then apply such an amount as is deemed suitable; on a small area double the application and leave it off on a small part of the field, as a check.

MR. ELLWOOD WILSON: Have you made any experiments with wood ashes?

DR. WHEELER: Yes, they contain about 32 to 35 per cent of lime, about 1.5 to 2.5 per cent of phosphoric acid, and usually from 3 to 8 per cent of potash and 3 to 4 per cent of magnesia. The lime is especially valuable, because it is readily available and sweetens the soil quickly.

MR. SNOWBALL: Is the ash from hardwood or softwood best?

DR. WHEELER: If potash is deficient in the soil, I prefer the ashes of hardwoods, for they usually contain a higher percentage of potash.

DR. P. H. BRYCE: How much lime is there in ordinary coal ashes?

DR. WHEELER: I think not over two or three per cent in readily available form. Perhaps Prof. Shutt could say.

PROF. SHUTT: Very little, but possibly more than that.

DR. P. H. BRYCE: What is the remainder of the coal ashes?

DR. WHEELER: Mostly silicates, clayey matter and other useless materials.

DR. P. H. BRYCE: If coal ashes are placed on a black soil here the land always produces a better crop than where not used.

DR. WHEELER: They also improve the physical condition of sandy soils, but the improvement should be commensurate with the cost of hauling and applying them.

MR. WILSON: Do wood ashes leach out of the soil very rapidly?

DR. WHEELER: No, I have observed benefits from wood ashes ten or twelve years after they were applied.

MR. SNOWBALL: How do wood ashes compare with lime?

DR. WHEELER: Pound for pound, I should prefer ground limestone to wood ashes as far as the lime is concerned, but one must not forget the other valuable ingredients in the wood ashes.

MR. SNOWBALL: Have you found it liable to make potato crops scab?

DR. WHEELER: Yes, if the micro-organisms which cause the disease are present in the soil or on the seed. In that case I can guarantee you a splendid development of potato scab, but otherwise I do not think the ashes will cause such injury. The same is true of any alkaline substance, stable manure or sodium carbonate.

MR. SNOWBALL: Wood ashes are used a good deal in the county I come from, and the question is sometimes asked me. I happen to produce the wood ashes and do not know much about it.

DR. WHEELER: If I were in charge of Canada, I would say, as I once said in Wisconsin, "If I were in charge of the state of Wisconsin, I would issue an edict that no potatoes should be planted without being treated with corrosive sublimate or formalin, for I know that the scab germ will live in the soil for eighteen years, even if no potato crop is grown in the meantime. That is the reason why the organism should not be allowed to get into the soil in the first place.

MR. SNOWBALL: That accounts for something that occurred in my county this year. I know of places where potatoes had not been grown for almost twenty-five years; you would think they would be almost free from scab, but this year they did have scab.

DR. JONES: If wood ashes benefit the soil, is that not proof that the soil needs lime?

DR. WHEELER: Strong proof but not positive proof, because the benefit might be due to the potash alone. The chances are that it is the lime.

At the Pennsylvania State College they have produced twenty barrels of apples by using fertilizers, as compared with four in one year and six in another where fertilizer was not used.

SENATOR EDWARDS: I do not think I have ever heard a paper so well discussed as this one has been, and with very good results. I am sure you are all much interested in the paper, which is a very useful one to Canada and I hope that we will benefit from it. Dr. Wheeler was for many years the Director of the Rhode Island Agricultural Experiment Station. I hope they have many like him in the United States.

Fertilizers and Their Use In Canada

BY

FRANK T. SHUTT, M.A., D. SC.

Dominion Chemist

THE request to take part in this morning's programme in the consideration of this important subject of fertilizers and their use in Canada, reached me at almost the eleventh hour, and this, together with the fact that we are busily engaged with matters arising out of war conditions has made it impossible for me to prepare a paper which might completely and satisfactorily set forth the investigational work that we have done and are doing in Canada under the direction of the Division of Chemistry of the Dominion Experimental Farms system. However, as such a paper would necessarily have been too long for presentation in the time allotted, I shall content myself with bringing before you, as concisely as possible, some of the more important conclusions we have tentatively reached.

Recognizing that employment of fertilizers in Canada to date has been limited, and that, to-day, their use is practically restricted to certain areas devoted to potatoes, sugar beets, tobacco, market garden, or other specialized "money" crops, and further, that our experiments, from which reliable conclusions could be drawn, have been carried on at a comparatively small number of points in the Dominion and over comparatively short periods of time, it should be distinctly understood that our conclusions are, more or less, tentative in character. We do not wish to be dogmatic as to the interpretation of the results obtained and we shall be extremely cautious in the matter of prophecies for the future.

Small as our use of fertilizers has been, that use is steadily, though certainly slowly, on the increase, and, doubtless, with the adoption of more intensive methods (which will follow as our country becomes more thickly settled) and with better, steadier markets for farm produce at home and abroad, this use will more and more increase. Indications are all in this direction, but it would not be wise to advocate, throughout Canada, the general and indiscriminate use of fertilizers on all soils and for all farm crops. While we are anxious that our yields should reach the highest possible profitable limit, there are no grounds for preaching the doctrine, as is the opinion of some, that this can be effected simply by the application of fertilizer.

Fertilizers are
Supplementary

Fertilizers have a place in a rational system of farming; but farmers should first clearly understand what that place is, if our land is to improve rather than to deteriorate, and if financial loss, due to injudicious purchase of fertilizers, is to be avoided. We must first have sound education, the outcome of science with practice, on the principles involved in the up-keep of soil fertility, on the composition, value, care and application of farm manures, on the desirability of more live stock on our farms and the greater consumption on the farm of the land's produce; on the importance of rotations, and especially the value of clover and other legumes in the rotation for maintaining the humus and nitrogen of the soil, on the proper working of the land and the preparation of a good seed bed. When all these matters are correctly understood and practised, then, and not before, may we advocate the judicious employment of fertilizers with advantage, in general farming. Fertilizers are no panacea for the evils of poor farming—they cannot be depended on solely to give profitable yields, to leave the land richer for posterity than when first broken, or entered upon. That is what we ought to aim at, for our native fertile soils are a great and important national asset and inheritance. Our experience has shown that fertilizers cannot profitably be used as substitutes for manure, for the growing of clover, or for good soil management, but that their rôle is rather supplemental to all these rational means for the up-keep of soil fertility.

I make this statement for two reasons: First, there are, at the present time, those who are urging us to a large and practically universal, almost indiscriminate, use of fertilizers; and second, from our voluminous correspondence on the subject, it is evident that, for the most part, it is the man using poor farming methods who is clamoring for cheaper fertilizers, and who practically expects to conduct his farming profitably from their exclusive use. I feel assured we shall never see the time when fertilizers can be profitably used as a substitute for those means which science and practice alike have shown to be necessary for the economic up-keep and increase of soil fertility.

Helping the
Farmers

But there is a place for fertilizers in farming, and we are helping our farmers to find it. There are those of the old school still in the land, however, who have no faith in fertilizers, those who relegate them to the class of quack medicines, as frauds and fakes, and who say they act merely as a whip to a tired horse—as stimulants and not food. The number of these persons is happily decreasing. Again, there are others who, almost as ignorant of the principles of agriculture as

Photos courtesy Dr. F. T. Shull.



FERTILIZER INVESTIGATIONAL AREA AT FREDERICTON

Experiment A: Three year rotation—second year of rotation (1916) crop of oats.

Upper Photo: Plot received neither fertilizer or manure; yields, per acre, potatoes (1915) 133 bush., oats (1916) 37.5 bush. grain and 1,404 lbs. of straw.

Lower Photo: Treatment.—In 1915 in addition to manure at the rate of 15 tons per acre, the following fertilizers: Nitrate of soda, 150 lbs.; super phosphate, 320 lbs.; muriate of potash, 112.5 lbs. In 1916 a further application consisting of 175 lbs. of the same mixture was given. Yields, per acre: Potatoes (1915) 207 bush.; oats (1916) 53.5 bush. grain and 2,560 lbs. straw.

Increased yields (per acre) accredited to the manure and fertilizers: Potatoes (1915) 74 bush.; oats (1916) 16 bush. grain and 1,156 lbs. straw.

those just referred to, argue that if fertilizers are sources of available plant food, all that is necessary to increase our crop yields is to apply them generously. These persons are ignorant of the fact that there are limiting factors to crop growth other than the presence of available plant food. We may enumerate some of them. First, there is the nature and physical condition of the soil, its capacity for holding moisture (dependent upon its texture and its humus content), in other words, its power to withstand drought, also its degree of aeration, its drainage, etc.—all those qualities of a physical character which make for the easier development of the root system. Second, the character of the season, by which I mean the amount and distribution of rain, temperature, hours of sunshine, etc. So far as we can see today, seasonal conditions are the most potent of all determinative factors in crop yields in Canada, as probably, also, all over the world. And, lastly, there is the inherited capacity for growth and reproduction in the crop sown. All these, with some others, are limiting factors that cannot be overlooked; they are factors which may and do profoundly modify the effect of fertilizers. For instance, upon heavy, undrained clays, what chance is there that fertilizers can play their part in nourishing the crops? On the other hand, as plants can only absorb their soil food in the form of a solution, how can fertilizers feed the crop, if the light soils readily dry up with a few days drought, owing to lack of humus or want of surface cultivation? Or, again, if we are sowing a variety of oats, the prolificness of which is measured by 40 bushels per acre, can we make it yield 60 bushels by simply feeding it? Many of these limitations may be in some degree overcome through the application of the teaching of science—of chemistry, physics and biology, but they are not to be overcome simply by the application of fertilizers.

The Soils of Canada

Since no intelligent consideration of this subject is possible without some knowledge of the native and natural fertility of the soils which it is sought to improve by the application of fertilizers, a word or two must be said of Canadian soils in general. Time will not permit of more than a few generalizations, though the data we have amassed on this phase of the subject during the past twenty-five years are not only of great scientific interest but will be found to have a far-reaching importance in connection with the future of the agricultural industry of Canada.

As might be expected, there are within the domains of the Dominion, soils of many types and classes, ranging from the most fertile to be found anywhere in the world to those so poor and thin as to

be practically worthless for ordinary farming, and which should be reserved for forestry purposes.

Every province in the Dominion possesses tracts of land of considerable magnitude that compare favourably with the most productive of other countries. But, in respect to the size, number and relative fertility of these tracts, the provinces differ, and in this fact will, no doubt, be found one of the factors in determining what might be termed the provincial consumption of fertilizers. Other factors to this end will be density of rural population, character of farming, proximity of markets for concentrated products, etc. It is not simply a case of relative poverty of soil, as might be at first supposed, that determines fertilizer consumption.

As is well known, the provinces of Manitoba, Saskatchewan and Alberta contain the largest and most continuous areas of the richest soils. Many of these, as our analyses show, are veritable mines of plant food; for example, the alluvial prairie of the Red River valley, the uniform fertility of which it would be difficult to exaggerate.

Without discussing the relative agricultural values of the arable lands of our several provinces, the indications are that fertilizers will be found more particularly helpful in the Maritime Provinces, in Quebec and in British Columbia. This does not mean that profitable farming will not be possible in these provinces without fertilizers, but that they possess areas of cultivable land upon which these aids to fertility can be used profitably and to advantage when coupled with rational methods of soil management.

Climate and Fertility

A cognate feature which is frequently overlooked, but which has a more or less direct bearing on the fertilizer question in Canada, is the influence of climate on fertility. It is realized by few that climatic conditions—rainfall, temperatures, etc.—exert a profound influence on the nature and composition of soils, both in their origin and in the power to conserve their fertility. These influences may tend to the accumulation or the dissipation of those elements or soil constituents which make for fertility. In this regard, save our coastal lands with excessive rainfall, which may keep the lighter soils poor in available plant food, our country is singularly blessed. We cannot now elaborate this question, but one instance may be cited that may serve as an illustration—one which undoubtedly influences in a beneficial way the fertility of our soils. The rigorous winter that prevails over the greater part of Canada locks up for several months—practically from harvest to seeding time—the soil's fertility. The plant food that has been converted into available forms during

the preceding summer and autumn and which is left over after the season's growth, is conserved for the crop of the succeeding year. The frost holds tight within its grasp plant food of untold value—especially the more valuable nitrates, so necessary for stimulating the growth of the young crop. In regions enjoying a more open winter, this soluble plant food would be lost by leaching. With all their drawbacks, our severe winters, with their almost continuous low temperatures, must be regarded, in their rôle as conservers of fertility, as an agricultural asset of no small value, one which must profoundly affect in a beneficial way our dependence upon purchased fertilizers for satisfactory yields.

CONCLUSIONS FROM EXPERIMENTS WITH FERTILIZER

We must now endeavour to present, in the most concise form possible, some of the more important conclusions reached by us in our fertilizer investigational work during the past twenty-five or thirty years. The amount of data we have to draw upon for these conclusions is very voluminous, but this fact does not, unfortunately, lessen the difficulty of the task. That only outstanding and apparently clearly established conclusions may be presented here, I shall eliminate all consideration of work which, for one reason or another, has not yet given concordant results, work which has not yet arrived at the stage for final deductions and work which, from faulty planning or carrying out, or owing to the misfortunes of the weather, has been, in our opinion, vitiated. As details of weights of fertilizers applied, crop yields, etc., consume much time in presentation and are difficult to follow with appreciation, we shall practically omit their statement and consideration.

The Prairie
Provinces

Particular interest attaches to the question of fertilizers in the great grain-growing provinces of Canada—Manitoba, Saskatchewan and Alberta. We are very anxious to increase our north-western yields, especially in these days, when our wheat is needed to sustain the soldiers of our Empire in the great war we are waging for righteousness and justice. But we have no data which would justify us in saying that this could be profitably brought about by the application of fertilizers. For ten consecutive years—from 1900 to 1909—we carried on a series of fertilizer experiments on the Experimental Farms at Brandon, Man., and Indian Head, Sask. The series contained plots dressed with several forms of nitrogen, of phosphoric acid and potash, singly and in combinations of twos and threes. The results, taken one year with another, failed to indicate any material

increase in the yields of the fertilized over those of the unfertilized plots. Frequently the latter gave the larger crops, but it was seldom that the differences between the plots of the series exceeded the amount that might be attributed to experimental error. Certainly there was no consistent increase due to any fertilizer, and in no case was the increase sufficient to cover the cost of the fertilizer. These experiments, it must be noted, were conducted on excellent soil, of high quality, and wheat was the crop used.

For some years past we have carried on fertilizer experiments at a number of Experimental Stations in northern Saskatchewan and Alberta. So far these have failed to indicate any specific want of plant food in the soil; the results were irregular, and the increases on the dressed plots were not of that magnitude to warrant definite conclusions as to the virtue of the several fertilizing constituents employed or the expenditure for their purchase and application. On the whole, therefore, our results have been of a negative character.

With respect to the future, my opinion is that the time may come when phosphates will be found useful. My reason for this conclusion is that, of the three essential elements, these soils are least rich in phosphoric acid, and that the extensive growing of grain crops will tend to diminish the available store of this element that is more or less available for crop use. Moreover, phosphates may be found of value in inducing an earlier maturity of the crop—a matter of much importance in districts where early autumnal frost endangers the ripening wheat crop. The introduction of mixed farming, with the adoption of rotations which will serve to maintain the humus content of the soil, should be sufficient, in my opinion, to obviate any necessity for relying generally on fertilizers for the up-keep of the fertility of these soils. At the present time, I feel assured that the determinative factors in crop production in these regions are the seasonal conditions, more especially as to the amount and distribution of the spring and early summer rains, and the thoroughness with which the land is prepared, which latter, of course, is intimately connected with the vital question of the conservation of soil moisture. If our northwestern lands are not to be allowed to deteriorate, mixed farming must be more and more introduced, and it is, above all, imperative in the highest degree that the humus content be constantly replenished, not only to keep fibre in the soil that will prevent loss from “blowing,” but to maintain their present high capacity for holding moisture.

**British
Columbia**

With regard to British Columbia, the results that we can review for the purpose of this paper have been chiefly obtained at the Experimental Farm at Agassiz, 80 miles from the coast, the soil being of a poor, gravelly or sandy nature. Many of these experiments have been in course for six and seven years. Potatoes and mangels are the two crops that have been chiefly used, though there is one extensive series under a four-year rotation, including one year of oats. The results have been somewhat irregular, varying with the character of the season, but emphatic evidence has been obtained as to the effectiveness of fertilizer applications in conjunction with manure, more especially on the mangel crop. The most profitable results have been obtained from the use of a "complete" fertilizer, that is, one supplying nitrogen, phosphoric acid and potash. In the larger number of instances the fertilizers yielded a good profit. The more profitable formulæ contained nitrate of soda, 100 to 160 pounds; superphosphate, 350 to 400 pounds; and muriate of potash, 100 to 200 pounds, these amounts being per acre. The evidence so far is satisfactory, in pointing to a profitable use of fertilizers on hoed crops, provided that use is judicious and rational.

We are unable, at the present time, to say what may be the value of fertilizers in the interior of British Columbia—the so-called "dry belt," in which irrigation is practised—but experimental work is in progress there which will, in the course of a few years, furnish useful data. Arguing from the nature of the soils and the climatic conditions that prevail there, however, it is not likely that the response will be of the same large order of merit that we have observed on the coast and on Vancouver Island.

**Central
Experimental
Farm**

Investigational work with fertilizers was instituted on the Central Experimental Farm, Ottawa, in 1888, and is still in progress. As the data are very voluminous, time will not permit a review of all the numerous lines undertaken. It must suffice here to indicate some of the more important or outstanding of the results obtained. The soil is a light sandy loam, of medium quality, and, in the larger number of the experiments, especially during the latter years, a three-year or four-year rotation has been followed. Great difficulty has been experienced at this station from lack of uniformity in the land under experiment; indeed, this is a difficulty we have been forced to contend with at a considerable number of our stations, though all possible care was taken at the outset to select a suitable area for the work. It should be added that the work at Ottawa has included the com-

parison of fresh with rotted manure, the manurial value of clover as compared with farm manures and fertilizers, and the testing out of a number of materials not generally recognized as fertilizers.

Perhaps one of the most remarkable results obtained has been the discovery that, as far as ordinary farm crops are concerned, fresh and rotted manure, applied at the same rate, have given practically equal yields. The explanation for this is not easy to find, since rotted manure, weight for weight, is very considerably richer in plant food than fresh manure. It probably lies in the better inoculation of the soil with desirable micro-organisms for the conversion of soil plant food into assimilable forms by the fresh manure and the greater warmth set up by its fermentation in the soil affecting beneficially the crop in its early stages. But, be this as it may, we have the practical deduction that there is no concomitant gain from the use of rotted manure, in the ordinary farm rotation, for the labour involved in rotting it and the large losses in organic matter and plant food that inevitably accompany the operation. The quicker the farmer can get the manure into the land or onto the land the better, for it is never worth more than when first produced.

Manurial Value of Clover	The manurial value of clover need not be dwelt upon at any length. Our work in this connection is fairly well known throughout the Dominion. It has been of an exhaustive nature and has yielded most satisfactory results—indeed, it would be difficult to overestimate its value to Canadian agriculture. Chemically, physically and biologically the growth and turning under of clover improves the soil, and we have been enabled to demonstrate over and over again that a crop of clover in the rotation has a manurial effect equal to an application of farm manure of ten to fifteen tons per acre.
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As regards fertilizers, our work has not shown any marked specific deficiency in our soils, though the response to nitrogenous fertilizers is perhaps the most pronounced. Almost invariably, the increases have been larger and more profitable from a complete fertilizer than from an application of any one or two of the fertilizer constituents.

While, in general farming, fertility cannot be economically maintained and profitable yields obtained by the *exclusive use* of fertilizers, *our experiments have shown that fertilizers may be used to good advantage in conjunction with farm manures.* This deduction is probably true for the greater number of our agricultural areas in Eastern Canada and on the western coast. When manure is scarce, or has to be purchased at a high price, then it will assuredly be found desirable to purchase fertilizers, not to take the place of

the manure, but to supplement its scanty use. If we cannot apply manure at the rate of fifteen tons per acre, our experiments indicate that we can use half that quantity and dress with judicious amounts of fertilizer without materially affecting the results. The probability is that, today, on the average farm the net profits per acre would be much the same under either system of procedure. With cheaper fertilizers, or with a higher rating for farm manures, than we have today, there would probably be a more profitable showing from the manure and fertilizer mixture than from the exclusive use of manure.

No profitable response has been obtained from the direct application to the soil of finely ground untreated mineral phosphate (apatite), though special experiments, in which this material was mixed with actively fermenting manure, the whole being left for several months, showed that small amounts, practically traces, of the insoluble phosphate were converted by this means into soluble forms.

Basic slag has proven the most useful phosphatic fertilizer on sour soils or heavy clay loams, on soils naturally deficient in lime, and on peats and mucks, while on the lighter soils rich in lime, superphosphate has given the quickest returns, especially for turnips and the cereals.

On land in fair condition a top dressing of nitrate of soda, applied in the early weeks of growth, has been found beneficial to grass, more particularly when intended for hay.

No potassic fertilizer has proved more valuable than good hardwood ashes. Of the three essentials, potash appears to be the least needed, but, on many light loams, it has given a good return, for encouraging the growth of clover and for vegetables and leafy crops generally. Muck and peaty soils frequently stand in need of this element. On heavy clay soils potash is not, as a rule, remunerative.

Fertilizers
in Eastern
Canada

By far the larger amount of our investigational work with fertilizers has been carried on in recent years in the Maritime Provinces, especially New Brunswick and Nova Scotia, and our results merit a more detailed consideration than we can now give to them. However, it is satisfactory to note that the deductions made from the work at Ottawa hold good in the main for eastern Canada. There is, however, apparently a larger and more lucrative field for fertilizers in the east, not simply as we might suspect, from poorer soils, but from the fact that the crops upon which they are used are more particularly "money" crops, such as potatoes, apples, etc., from which a larger money return can be expected. If the maximum gross returns per acre

are in the neighbourhood of \$150 rather than \$50, it is obvious that the prospect for a remunerative response from the fertilizer is greatly enhanced.

The importance of manure and clover in maintaining the humus content of the soils has been strongly emphasized in all our work in Quebec and the Maritime Provinces. Perhaps I might say that the need for these means of soil improvement is greater, speaking generally, than in Ontario. But, be that as it may, we have almost invariably obtained the more lucrative responses from fertilizers on soils enriched by manure and under a rotation in which clover is a member. On potatoes and market garden crops generally, an application of manure at the rate of 15 tons per acre, with a moderate application, say, of a well-balanced fertilizer, has given more profitable returns than either 30 tons of manure or a dressing of 800 to 1,000 pounds of a similar fertilizer without manure. These results have been confirmed at many points and in different seasons. The largest profits obtained have been from this combination and not from very large applications—1,000 pounds or over—of fertilizer, no matter how well blended to suit the soil and crop requirements. This, translated, means what we have already stated, that the rôle of fertilizers, if they are to be used profitably, is as a supplement to, and not as a substitute for, manure.

Results of Experiments

The majority of our experiments have shown that excessively large dressings of fertilizer have not given net profits per acre of the same magnitude as medium applications, say, 400 to 600 pounds, and we counsel our farmers to ascertain, each for himself, by experimentation and the employment of an undressed area or check plot, what the limits of profitable application are for his land. There is, unfortunately, in the present state of our knowledge, no laboratory method by which we can do this for him.

Again, we found that the greater return—the larger profit—came from using a complete fertilizer, that is, one containing nitrogen, phosphoric acid and potash, and this points to the conclusion that the function of fertilizers is to raise the small proportion of available plant food in the soil rather than to increase materially its total plant food content.

Summarizing

Our experiments, in general, have gone far towards establishing that a judicious and rational use of fertilizers may be depended on to yield a profit, that the *exclusive* use of fertilizers will neither keep up the fertility of the soil nor yield profitable returns, and that it is on soils of medium

rather than poor quality that a lucrative response from their employment is to be expected, and, lastly, that it is on the "money" crops that we shall find the application most profitable.

Had time permitted, we might have informed you of the valuable results we have obtained with liming and the use of finely ground limestone, especially in Eastern Canada, of our experiments with fish-waste manures and with dried ground seaweed; of the many naturally-occurring materials of manurial value in our country that might be more generally used, and many other phases of this great and important subject of maintaining and increasing soil fertility. In this address I have endeavoured to tell you, briefly, of our extensive experimental work with commercial fertilizers and its results, and, further, what is perhaps more important, our teachings and the position we have taken based on these results. The advice that is constantly and increasingly asked of us by our farmers to guide them in their use of fertilizers finds its foundation largely in the deductions brought forward today, and we trust we have in some small measure made clear the general lines upon which that advice is given.

DISCUSSION

DR. W. J. RUTHERFORD: The papers on artificial fertilizers by Dr. Wheeler and Dr. Shutt were both interesting and instructive. Dr. Shutt has explained very fully, and in a very excellent manner the conditions that prevail in the Prairie Provinces. Pioneer farming has been well described by Dr. Wheeler. Our farmers are not all conservationists. Fortunately or unfortunately our western provinces are blessed with a very rich soil and their development, so far as grain growing is concerned, has gone on apace. In 1900 the territory that is now known as the Province of Saskatchewan grew a little over 3,000,000 bushels of wheat; in 1905, about 26,000,000 bushels, and in 1915, about 176,000,000 bushels of wheat, 130,000,000 bushels of oats and 18,000,000 bushels of barley and flax. While Saskatchewan has been so rapidly developing grain growing, she has also gradually crept into second place among the provinces of Canada both in numbers and value of live stock, horses, cattle, sheep, swine and poultry, being exceeded only by Ontario. The three Prairie Provinces, according to the last Dominion census, own forty-two per cent of Canada's live stock.

The fertility problem on the prairies is a somewhat different one from that of the older provinces. We have an abundantly fertile soil, but a scientist has recently estimated that, if we shipped

away only 100,000,000 bushels of wheat annually from Saskatchewan, we would ship away fertility—nitrogen, phosphorus and potash—that would cost millions of dollars to replace in our soil by the application of artificial fertilizers. We are not concerned about bringing back fertility, but we are deeply concerned about the conservation of our fertility. Every twenty-five bushels of wheat carries away with it 35.5 pounds nitrogen, 6 pounds phosphorus and 6.5 pounds potassium, and this, at pre-war prices, has a value on the eastern market of \$5.89. Every 100,000,000 bushels would, therefore, carry away fertility with a market value of \$23,560,000, not including freight.

The question at once arises "How can you continue to ship wheat and yet conserve fertility?" It is agreed by most experts that the cheapest and most rational means of conserving the soil resources of the prairies is through the feeding of animal and mill by-products from the packing plants and flour mills to live stock and applying the farmyard manure to the land. But our milling industry is very small. It is growing; but markets, lack of cheap power and labour scarcity all retard its development. Our prairie farmers are urged to increase their live stock holdings for various reasons. We have heard from the chairman this morning of our bracing climate—so suitable for growing strong, healthy men and robust sheep, horses, cattle, etc., but there are disabilities in the way of live stock production in Saskatchewan. We feel strongly on this point. Saskatchewan's future development must for generations to come be along the lines of agriculture. Her soil is fertile and her climate is suitable for the growing of wheat, oats, barley, flax, grasses, alfalfa, clover, roots and live stock of various kinds. Knowing this, it is felt that the disabilities should be investigated and, so far as possible, removed. The farmers have long held the opinion, either rightly or wrongly, that the dead meat industry was in the hands of a powerful combine, and that they were not getting a square deal. This opinion is not held by our farmers alone. At a convention recently held in Chicago, called together for the purpose of considering the questions of rural credits and marketing, the conference was asked, by representative live stock men from all parts of the United States and by many organizations interested in live stock production, that it lends its strongest influence to induce Congress to have the whole meat killing and packing business laid before the Federal Commerce Commission for investigation, and it was stated that the packers themselves should be the readiest to have the whole question submitted to such a tribunal. Our farmers, and others interested,

as I stated before, feel that the marketing question, especially that connected with the abattoirs, is one of the great disabilities under which they are operating. So long as this feeling prevails generally so long will our live stock development be retarded, and so long will our agriculture rest upon an unstable basis.

This Commission stands not only for conservation but for development with conservation. Its influence might well be exercised in such a way as would lead to a Federal investigation of a question that affects so vitally the industry and the permanent resource of so great an area as that comprised by the Prairie Provinces. The books of the elevator companies were opened to the Federal Government. The disabilities of the grain trade have been in great measure removed through federal action and thorough provincial co-operation. Similar action in connection with the live stock industry would inspire our people with confidence in this line of endeavour and would go a long way towards placing our agriculture on a sound, safe basis.

But we need more. Our rivers in the southern half of the province do not lend themselves at present to a hydro-electric scheme for the furnishing of cheap power. We have, however, immense lignite beds, extending from the Alberta to the Manitoba boundary across southern Saskatchewan. These should furnish for our people, not only a good cheap fuel in the form of briquettes, but also cheap electric power that could be utilized in manufactures that should grow up out of our agriculture. The milling industry would thus receive a stimulus as well as the flax industry and others. And these are essential, I submit, if we are going to maintain our fertility through the feeding of live stock. The farmer wants cheap bran, shorts and oil-cake. At the present time these industries are conducted mostly outside of Saskatchewan. We have the nucleus of a milling industry at Moose Jaw, Saskatoon and at various other points, but we need cheap power for its fullest development. And this commission could, I am sure, well afford to direct enquiry to the question of the development of our lignite beds, or such other sources of cheap power as will lend itself to the best development and conservation of the prairies.

SENATOR EDWARDS: With reference to the milling, the difficulty is one that cannot be cured, the reason being that flour cannot be shipped from Canada to any very large extent. No matter how much fertility may be lost by sending out the whole wheat, that practice must continue. Great Britain, the largest buyer of wheat in the world, buys comparatively little Canadian wheat under existing conditions, and she will not likely buy more. They buy

wheat from various countries and mix it, and for that reason it is claimed we cannot ship a very large quantity of flour from Canada; we grind almost wholly for our own consumption and cannot grind for exportation to any appreciable extent. As to the combine, while I am not trying to foster the combines, how is it that live hogs and live animals are at such an exorbitant price to-day if these people control the prices?

DR. RUTHERFORD: Our experience is that several times, when our people have gone into hogs fairly heavily, then the price would go down to such an extent that they believed there was some kind of manipulation. It is hard to get them to believe anything else, unless it can be done by some influential body with power to investigate the whole question. This was done in the case of the grain trade, where the Grain Growers Association had the books laid open by the Federal Government, and then they knew the whole grain question. If the disabilities, or difficulties, or hindrances, so far as live-stock is concerned, are removed, our people will go into live-stock on a much larger scale than they are doing at the present time.

I have understood that there are difficulties in the way of milling on the prairies but, given cheaper power, the chances for building up this industry and others would be greater.

Memorandum of Soil Tests

BY

DR. F. B. LINFIELD

*Director, Montana Agricultural Experimental Station,
Bozeman, Montana*

IN view of the prominence given to the subject of analysis of soil for agricultural settlement purposes, and as an index to the question of the requirements of fertilizer, I am forwarding herewith a statement of some analyses made by our chemist of soils from various parts of the state of Montana.

The first analyses were made from samples of soil from Wibaux and vicinity. Wibaux is in the extreme eastern portion of the state, on the main line of the Northern Pacific railway where it passes out of the state:

Sample	Nitrogen	Lime (CaO)	Phosphorus (P ₂ O ₅)
476	.191	2.40	.17
478	.216	5.27	.22
481	.270	5.88	.18
483	.110	3.25	.13
486	.041	2.91	.085
487	.152	5.36	.13
491	.154	.62	.18
494	.155	2.40	.10
497	.172	1.36	.11
500	.140	4.20	.13
523	.196	6.62	.15

From Glasgow, in the Milk River valley, in the northwestern portion of the state, the following samples were collected:

Sample No. 556, which is representative of the South Bench, near Glasgow:

Nitrogen	Lime (CaO)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)
.135	3.80	.120	.56

Sample No. 557, representative of the North Bench, near Glasgow:

Nitrogen	Lime (CaO)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)
.122	.65	.126	.68

Sample No. 558, representing the bottom land near Glasgow:

Nitrogen	Lime (CaO)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)
.139	1.49	.174	.58

The following samples were collected from Judith Basin, which is about the centre of the State and one of the most successful dry farm and fall wheat sections:

Sample No. 579, from Mr. Fuller's ranch:

Nitrogen	Lime (CaO)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)
.158	1.06	.212	—

Samples Nos. 581 and 583, from George Fleming's ranch:

Nitrogen	Lime (CaO)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)
.218	.84	.223	.58
.082	.34	.341	.71

Sample No. 585, from W. J. Evans' ranch:

Nitrogen	Lime (CaO)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)
.071	10.00	.226	.45

Samples collected from the upper part of Bitter Root valley, which is west of the Rocky Mountain divide. The soil in this district varies very much, and the samples are from soils that had been giving trouble, and where the brown spot injury was prevalent:

Samples taken from Tiedt Land and Orchard Co:

Sample	Nitrogen	Lime (CaO)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)
833	.026	.22	.025	.24
835	.016	.197	.024	.22
837	.018	.197	.021	.20

These samples undoubtedly represent the poorest soil on the orchard tract. Some of the best soil in the same orchard analyzed as follows:

Sample	Nitrogen	Lime (CaO)	Phosphorus (P ₂ O ₅)
871	.087	.381	.062
872	.073	.374	.052
873	.073	.341	.051
874	.052	.289	.039
875	.056	.315	.054
876	.022	.145	.104
877	.044	.223	.040
878	.026	.145	.037
879	.039	.236	.059
880	.142	.355	.064
881	.076	.223	.033

The Experiment Station farm contributed the following samples. These are from our irrigated land in the Gallatin valley, which has been cropped for forty years:

Sample	Nitrogen	Lime (CaO)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)
61	.16	1.12	.24	.64
62	.176	1.18	.23	.54
63	.244	1.25	.19	.63
64	.157	.82	.22	.28
65	.176	1.35	.39	.69

The following analyses are made from soils taken from the Fort Ellis farm, which is dry bench land, with a very deep black loam, that has only been cropped for a few years. The samples represent foot sections taken to a depth of eight feet:

Sample	Nitrogen	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)
3544—1st ft.	.263	.548	.61
3545—2nd "	.111	.51	.58
3546—3rd "	.476	.58	.70
3547—4th "	.054	.417	.58
3548—5th "	.0477	.382	.554
3549—6th "	.030	.452	.493
3550—7th "	.035	.452	.550
3551—8th "	.025	.446	.46

For convenience in studying these analyses, it will perhaps be advantageous to have the ratings of soils, with plant food percentages, as given by Prof. Maercker, Halle station, Germany.

Grade of soil	Potash	Phosphoric acid	Lime		Total nitrogen
			Clay soil	Sandy soil	
Poor	Below 0.05	Below 0.05	Below .10	Below .05	Below .05
Medium	0.05—0.15	.05— .10	.10— .25	.10— .15	.05— .10
Normal	0.15—0.25	.10— .15	.25— .50	.15— .20	.10— .15
Good	0.25—0.40	.15— .25	.50—1.00	.20— .30	.15— .25
Rich	Above 0.40	Above .25	Above 1.00	Above .30	Above .25

In studying the analyses you will note that the soil from the Bitter Root valley is the poorest in plant food of any which we have analyzed. We have analyzed some other samples from the western part of Montana and find that they are, as a general thing, lower than soils from the central or eastern portion.

The soil collected from Glasgow, in the northeastern part of the State, is lowest in phosphorus of any section which we have studied east of the main range of the Rocky mountains.

The soils analyzed from the vicinity of Wibaux are somewhat higher in both nitrogen and phosphorus than the soil from Glasgow. In fact, the soils analyzed from Wibaux are above the normal in nitrogen content, which suggests the possibility that the soil is more fertile than is usually found in that section, and the phosphates may be somewhat higher.

The soils from the Judith Basin compare quite favorably with that of the Experiment Station in nitrogen and phosphate content. You will note, however, that the soil analyzed from Fort Ellis is much richer in phosphates and nitrogen than any of the other soils analyzed. The lime content of this soil has not been determined, but there is no question but what it is well supplied for all future needs.

When one studies these analyses, it becomes quite evident that there is a lack of plant food in some sections of Montana, and it is further evident that the soil in the western part of the State is close to the border line so far as the phosphates are concerned. If the farmers are to continue raising grain almost exclusively, as they have in the past, it seems but a matter of a short time until they will have to begin using commercial fertilizers.

Co-operative Forest Protection

BY

HENRY SORGIUS

Manager, St. Maurice Forest Protective Association

CO-OPERATIVE forest protection has now passed the experimental stage in Eastern Canada. Looking back at our records for the last few years, and comparing them with those of former years, we can clearly see and understand the success of the present system over the old methods of forest protection.

All through the Dominion, we see evidence of lack of interest and understanding, in former years, of the value of organized co-operative forest protection. As the result of this one sees miles upon miles of barren hills, where once there were forests of untold value. Although the lumber companies and limit holders knew that it was to their own interest and benefit to keep their chief source of income—the forest—intact, many of them thought that the expense of fire ranging was so much money wasted, and made only feeble attempts to guard their forests against their worst enemy—the fire.

Wherever a company employed a dam-keeper or a cache-keeper, they appointed him also a fire ranger for a number of miles surrounding. A dam-keeper was always supposed to watch his dam and a cache-keeper never to leave his cache, so very little time could be spared to look after fires. Also, the foremen in charge of the logging operations and the clerks on drive were often supposed, besides their regular work, to act as fire rangers. These men all had their own work to attend to, and generally did not take much interest in forest protection; dependence was mostly placed upon the rain to extinguish the fires.

Not every company and its employees lacked the proper interest. Some concerns appointed regular rangers, but the companies that were desirous of protecting their forests had not only to protect their own property, but also the adjoining limits, whose owners did not have the welfare of the forests at heart.

Since the date of the annual meeting, the Southern St. Lawrence and Laurentian Forest Protective Associations have been organized, and the territory of the Lower Ottawa Forest Protective Association has been greatly extended, its name being changed to the Ottawa River Forest Protective Association. In round figures, the areas covered by the several Co-operative Associations is now (May, 1917), as follows:

	Square Miles
St. Maurice Forest Protective Association.....	11,000
Ottawa River Forest Protective Association	29,000
Southern St. Lawrence Forest Protective Association	15,000
Laurentian Forest Protective Association.....	15,000
	<hr/> 70,000

When there was no co-operation between the different companies, the expenses of patrol generally became very heavy. As a lumber company's limits are usually scattered in many localities, to protect them an unequal division was necessary.

Working out of
Co-operation

The system used by the St. Maurice Forest Protective Association is a good example of what co-operation will do in the protection of forests against fires.

Every natural advantage is utilized in obtaining the best results. The men employed on patrol work have no other duties than those pertaining to fire ranging. The cost has also been greatly reduced by co-operation. Where the limits of the members of a co-operative organization adjoin they may now be patrolled by the same men; under the old method each company would have employed its own fire rangers to patrol the same territory. Another important factor is that the rangers now are under the direct supervision of duly appointed inspectors.

To get an idea of the method which gives an efficient service at low cost, we will consider the general organization of the St. Maurice Forest Protective Association. In this association, an assessment of one-quarter of a cent per acre is levied on all the members. The income is used to pay the salaries of manager, inspectors and rangers, the cost of equipment and other general expenses. When extra labour for fighting fire is needed, the cost is borne partly by the Quebec Government and partly by special assessment on all the members according to their holdings.

To facilitate patrol, the territory of the association is divided into several divisions and each division into districts. An inspector who oversees the work of the rangers and looks after the general interests of the association, is in charge of each division.

Duties of
Fire Rangers

Each district is patrolled by one or two rangers, according to the facility of communication. Where there are good roads, one man with horse or automobile is used, while in the backwoods, where there are no roads, two men in a canoe do the patrolling. The size of districts varies; where there are no industrial operations and the fire hazard accordingly is smaller, a larger district can be handled by the rangers.

The ranger's first duty is to prevent forest fires, and when they do occur, to extinguish them. One great feature of fire prevention is the ability of the ranger to educate the people in his district to understand the great cause that we are working for. In dry weather he should always be on the move, watching fishermen, drivers, jobbers and other people travelling in the woods. Whenever he meets a person he should ascertain his name, his destination, give

Photos courtesy Henry Sorgius.



RESULTS OF A FOREST FIRE

This photograph was taken immediately after the fire was extinguished.



A FIRE FIGHTING CREW

Equipment is kept at selected places for use in extinguishing fires.

him advice when needed, and always warn him against the danger of forest fires. By giving the people kind advice and help, he will make them his friends and make them more willing to do their share in saving our forests.

Damp and rainy weather does not give the ranger a holiday while it lasts. He then exchanges the paddle for the axe, and clears portages and trails to facilitate communications, that, when fires occur, he can quickly and easily get men and supplies to the fires. The building of look-out towers on high and convenient sites in his district also keeps him busy during the wet seasons. At handy places, throughout his district, such fire fighting tools as shovels, mattocks, axes, fire pails, etc., are stored.

The association also patrols about 167 miles of right-of-way along the National Transcontinental railway, the patrolling being done by gasoline speeders. Each speeder is manned by two rangers and covers between forty and fifty miles, twice a day. By following about half an hour after trains, the rangers on the speeders are able to stop any fire that may have started along the right-of-way, before it has had a chance to spread.

During the past season, we tried out a new gasoline-driven pump, with 1,500 feet of one and a half inch hose, which has proven a great help to us in fighting fires. It only weighs about 140 lbs. and can be readily transported. Its cost was saved in the first fire at which it was used.

Settlers'	In the settled districts, the rangers supervise the
Burning	burning of slash. Clearing land is one of the worst
Permit System	menaces to the forests. Formerly, when a settler

wanted to clear his land, he put fire to the brush on his lot, regardless of time and weather. That millions of dollars worth of good timber went up in smoke mattered little to him, if it could save him a few days' labour in piling brush and watching it while it was burning. The laws of the province concerning forest fires and settlers' slash burning were so lax that the settler generally did what he pleased. In 1916, however, the Quebec Government amended the laws, and we hope the danger from slash burning is reduced to a minimum.

The settlers' burning permit system was first introduced in our territory in 1914. During 1912 and 1913 our association reports showed a large percentage of our fires caused by settlers burning slash in their clearings, but in 1914, as a test, we introduced the settlers' slash burning permit system in one of our districts. During that season, 125 permits were issued and the results obtained were very encouraging; the number of fires caused by settlers in this

district was reduced from 105 in 1913 to 4 in 1914. As 1914 was as dry a season as 1913, the result proved to us that the permit system was the right course to follow.

In 1915, we introduced the system throughout our whole territory. We issued 628 permits, and not one fire, started under this system, got beyond our control, thereby proving once more its complete success. Fires caused by settlers burning slash in their clearings were reduced from 80 in 1914 to 41 in 1915.

In 1916, the Quebec Government amended the Forest Protection Laws of the Province. One clause provided that no setting of fire to clear land was to be permitted between April 1st and November 15th, without a written permit from an authorized fire-ranger. This amendment facilitated the work of the fire-ranger in the field.

The past season has been the most successful one since the forest protection system has been organized. Our inspectors and rangers issued 1,213 burning permits, and not one fire was reported as being caused by settlers burning slash in their clearings throughout our whole territory, comprising over 1,000,000 acres of settled land.

Since the permit system has been inaugurated in our territory, the following results have been obtained:—

1914—80	fires	caused	by	settlers
1915—41	“	“	“	“
1916—00	“	“	“	“

**Working of
Permit System**

To obtain good results, the most essential point is the hiring of competent inspectors and rangers.

These men are often called upon to educate the settlers in their districts and to co-operate with them in their work. It is also the duty of the ranger to be friendly with the settlers and to render them assistance in their slash burning.

The ranger is instructed never to issue a permit before, first, ascertaining by personal inspection that the slash to be burned is piled at least 50 feet from any standing timber; and, second, seeing that the weather conditions are favourable. The permit should never be given for more than one day, unless during a wet spell and unless the slash is situated at a safe distance from any standing timber. If the slash were not completely burned during the first day, another permit can be issued the next day, if the weather conditions are favourable. The burning should never be started before four or five o'clock in the evening, and the fire should be completely extinguished in the early morning, except during wet spells, as heavy winds during the day may cause it to spread.

Early each spring, we send letters to the different parish priests in our territory, asking them to announce from the pulpit that we

wish to co-operate with the settler in the burning of his slash. In April, when the snow is still in the woods, rangers are sent out through the settled districts to issue burning permits to the settlers whose slashes are ready, and to encourage those who are not ready to prepare their slashings for burning under the supervision of the fire-ranger through the permit system.

During the past season, the rangers collected the names of all the settlers who will have any slashings to burn this spring. This list will enable us to make an early start this spring.

Rangers are also supplied with handbills to be distributed among the settlers. These circulars are left at every house, and during the past season 70,000, of four different kinds, were distributed. These have also helped us in our work, as they show the settlers the damage done by careless burning of slash. Church criers were also employed to explain to the settlers just what they were expected to do.

I am entirely convinced that more can be obtained from the settlers by being friendly with them and teaching them the right way to burn their slash, than by prosecution. In some cases prosecution is necessary, but great care should be exercised by an inspector or ranger before indicting a settler for setting fire without a permit. He should first see if a little friendly advice would not do better than prosecution. Prosecution is apt to create ill feeling between the settler and the fire-ranger, which generally takes a long time to rectify. In many cases we have found that the settler was not at fault, but that the ranger was using his authority in the wrong way.

Educating and maintaining cordial relations with the settlers has proven a success, as is shown by a case in our district. A fire was discovered by the settlers. Before the ranger reached it, the settlers of the vicinity organized a crew and extinguished it, but not one of them asked for any compensation.

If the slash burning permit system has been so successful with a forest protective organization, there is no reason whatever why the same results cannot be obtained by a smaller or larger organization. All that is necessary is the employment of competent inspectors and rangers to educate the settlers, as once the settler understands the system, he will never return to the old method.

As a conclusion, let it be said that the great problem facing, not only the lumber companies, but the public in general, is the guarding of the forest against fire. One fact that comes out all the time is the necessity of more co-operation. Co-operation has shown

Conclusion

itself the only way to solve this problem. It has done wonders in the past few years and will do wonders in years to come. Let all the lumber companies and limit-holders unite in fighting this menace and in fostering favourable public sentiment towards the preservation of this, our natural wealth. When every man is willing to do his share towards this end, then, and not before, will the fight against the destruction of forest by fire be comparatively easy.

DISCUSSION

Mr. ELLWOOD WILSON: Mr. Sorgius has told you everything that is done by our Co-operative Association, and he deserves a great deal of credit for the manner in which he has handled a very difficult situation. When the St. Maurice Forest Protective Association was organized, conditions were very bad. Settlers' fires, railway fires, and 'drive' fires were of constant occurrence, and in five years he has practically eliminated this great menace; only by accident can we now have any large fire.

The most important feature of Mr. Sorgius' paper is, of course, the question of co-operation. We had the hardest time to convince the people who should have been most interested that co-operation was necessary. The railways were the first people to side with us, partly through the influence of the Dominion Railway Commission. The settlers were the next, and the lumbermen, who should have been the most interested, were the last people to realize what co-operation meant. The head offices were unquestionably in favour of good fire protection. They were paying the money, they were interested in fire protection and they wanted fire protection. But the men in charge of the actual work, the heads of logging departments, choppers and operators in the woods, were absolutely opposed to any interference with what they considered their rights. They wanted to smoke, to make smudges, to leave slash in bad condition; and it was only by using the most extreme pressure that we were able to make these people realize the danger, for, up to last year, one half of the fires in the St. Maurice valley were caused by river-drivers and dam-keepers. However, since the head offices have brought pressure to bear on their logging managers, we have no more trouble. We heartily desire that this co-operation scheme could be extended. The Lower Ottawa Association has been very successful, but the Upper Ottawa is in very great need of the same system. The Saguenay district is also in need of co-operative fire protection and we hope that this year will see a wide extension of the co-operative principle.

Classification of the Crown Lands of New Brunswick

BY

P. Z. CAVERHILL

*Director of Forest Survey, Dept. of Lands and
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THE classification of the Crown lands of New Brunswick is the outcome of a movement that has been under consideration for a number of years. The Crown lands of the province, consisting of 7,750,000 acres, of which 6,500,000 are under license, constitute the chief source of provincial revenue. The value of the lumber industry is second only to agriculture and, at the present time, is upwards of \$15,000,000.

Many changes have taken place during the development of the lumber industry. During the first half of the 19th century the white pine was our important timber tree. In 1825, we exported, as square timber, over 400,000 tons of this species alone but, for years, it has been nearly depleted. Hemlock, a few years ago valued only for its bark, is hard to get at \$12.00 to \$14.00 per M. for the round log. On spruce it was found necessary to reduce the diameter limit from 18'-10" to 16'-9". Thousands of acres of good timber land have been taken up under the pretense of agricultural development, only to be abandoned after desultory attempts at clearing and cultivating, and after the occupants had burned, possibly, thousands of acres of good timber. These signs of the gradual depletion of forest land led to a movement for definite knowledge of the condition of the public domain, and a classification of the land as to whether it was chiefly suitable for agriculture or forest.

The first concrete step toward the classification was taken in 1906, when the Public Domains Act was passed. It authorized a survey of the Crown lands, estimating the timber thereon, the annual growth and the cost of logging, also delineating the lands suitable for agricultural development. The Act also provided for the calling of a convention in the interest of forest protection. This convention met in February, 1907. Funds were not available, however, to carry out the survey, and the net result was the establishment of the Forest School in connection with the University of New Brunswick.

The Act of 1913, renewing the timber licenses, made provision for the classification at present being undertaken. For a time only desultory attempts were made to carry out the provisions for classifications, and it was not until last spring that field work was actually started.

Objects of
Survey

As defined by the Act, the objects of the survey are: First, to report with as much detail as possible upon the character and quantity of the lumber, estimating the quantity of timber and the reproductive capabilities of the forest area. Second, to estimate as accurately as possible the annual growth of timber upon each area or tract. Third, to report upon the accessibility of the timber on each section, estimating the cost of logging on the different areas, and the cost of stream-driving to point of manufacture. Fourth, to report the location of lands deemed suitable for agricultural purposes, distinguishing them from other lands that might be regarded as especially suitable for the growth and reproduction of timber.

It was decided that a four per cent survey was the most desirable to obtain these objects; this consists of running strips through the timber at one hundred rod intervals (1,650 ft.) measuring the timber two rods (33 ft.) on each side along each strip, and tallying the trees by diameter classes and species. To obtain data of the soils, holes were dug at each one hundred rods along these strips, and notes on the character and quality of the soil taken.

Value of
Contour Map

The making of a contour map was considered, but, as a large portion of our Crown lands is either gently rolling or level, a low contour interval would be necessary to show any detail. In dense spruce stands, of which our New Brunswick woods are largely composed, it is impossible for the topographer to trace and plot the contour for any great distance on either side of the line, and it becomes necessary to either run strips at much closer intervals than we are doing, or offset from the line frequently, either of which would add materially to the cost of the survey. Very few points other than on the railways have definitely determined elevations, and obtaining vertical control would require extensive traverses from points of known elevation, this also adding to the cost.

A topographic map, of sufficient accuracy to permit of the laying down of roads and the planning of an operation from the information contained thereon, would probably cost, under our conditions, 15 cents per acre, varying from that figure to 25 or 30 cents per acre in the west, where the country is more difficult.

Photos courtesy P. Z. Caverhill.



MIXED SPRUCE, PINE AND ASPEN, NEW BRUNSWICK

The cutting for pine and spruce has greatly depreciated the value of this stand.



LOGS PILED READY FOR DRIVING, NEW BRUNSWICK

It takes 5,000,000 pieces to make New Brunswick's cut on Crown lands.

Topography in New Brunswick does not bear the same relation to the logging operation as it does in the west, where it is frequently the determining factor in the method of logging, and upon the topography depends whether or not they can use horses, donkey engines, with fore-and-aft roads, or have to resort to the more complicated overhead, or sky-line, methods of taking out the timber. On almost all our sites, horses can be used, and topography affects only the haul and, to some extent, the stream driving. As a topographic map, therefore, would be of little service to the Dept. of Lands and Mines in shaping its future timber policy, or in the valuation of the Crown lands, it was decided that the additional expenditure was not justified.

**Method of
Survey**

The main ground plan is made by running primary control lines and traverses of drivable streams, portage roads, etc.; these controls are about two and one-half miles apart, and are tied together every five to ten miles. Where straight base lines are used, old timber block lines are followed. This divides the area into rough blocks or divisions, irregular in shape and size, but sometimes in rectangular blocks. The interior of each block is mapped from notes taken along the strip. All control work is checked, so that the maximum error of closure is less than two per cent, and this is distributed throughout the traverse. Strip lines are tied to the base lines with an error not greater than four per cent.

The timber estimate is made by tallying all merchantable trees for a width of four rods along each strip, the tally sheets being so arranged that the timber is shown separately by species and diameter classes on each eight rods of the strip. This permits the showing in detail of the character of the stand and the type. From this tally, the estimate is made from local volume tables, changed according to locality, and constantly checked by measurement of all available "down" trees.

At the same time, notes are taken on condition of the stand, cost of logging, and condition of the stream for driving.

**Annual
Growth**

Determining of the annual growth is possibly our hardest problem. We need to know as closely as possible what the actual annual growth is, as it will show us what the results of our present system of management will be, and, by a comparison with the potential growth of that site, or with the growth of similar sites under different systems of management, we can determine what steps are necessary that we may derive the greatest financial benefit from our timber lands.

Our forest land is largely covered with a stand of many-aged mixed species; trees growing under all sorts of conditions, and these conditions constantly changing; as, for example, when logging is conducted on an area, the light and soil moisture conditions, under which the remaining stand exists, may be entirely changed.

A white spruce, measured seven years after logging, showed an increase of 125 per cent in the increment. But, while individual trees show this rapid increase, much of the forest capital is removed with the logging, and the net result in any but our over-stocked second growth stands will be a falling off in the yearly increment.

Method of
Study

By averaging a large number of acre strips, we were able to construct from our field sheets, an average or model acre, showing average conditions for any particular type. This gave the average number of trees by diameter class, per acre, of the different species, average height and contents, by species and diameter.

The growth per cent was obtained by boring into a large number of trees with an increment borer, and ascertaining the diameter growth for five-year periods for the past twenty years. The trees were taken at random, and recorded by types and diameter classes. Later, all trees of a diameter class on any particular site and type were averaged together, it being assumed that, if a sufficient number of trees were studied, an average could be obtained which would represent the average of that diameter class throughout the site. The growth per cent was then obtained for this average tree, and the per cent applied to the model acre.

This year we made only a beginning on growth studies, making borings in spruce, fir, pine and cedar. In all, some 2,500 trees were bored, and the results showed a growth per cent of from 0.6 per cent for cedar over 12 inches in diameter, to 3.6 per cent for white pine of 8 inches in diameter, or from 30 to 75 board feet per acre per year.

Next year it is our intention to supplement these figures by much more detailed studies, and it is hoped we will arrive at a very close approximation of the actual growth.

Agriculture

Perhaps one of the most important features of the survey is the classification and delineation of the agricultural lands, the objects being to direct future settlement to localities where there is the greatest opportunity for successful farming, and to prevent the denuding of purely timber land under the guise of clearing for agricultural purposes.

The success or failure of any agricultural community depends on four factors: First, climate; second, soil; third, personal; fourth, social.

Climate.—The climate in New Brunswick is generally favourable to agricultural pursuits; the winters, though long and severe, are followed by warm, pleasant summers with plenty of rain-fall; vegetation shows a remarkably fast development, although late spring and early autumn frosts limit the range of field crops to those developing and maturing in a little over three months.

Soil.—The soil is the factor with which this survey is chiefly concerned, and is, next to climate, the most important in limiting agricultural development. In the classification of soils on an agricultural basis two primary conditions have to be considered.

(1) Topographical Character.—Soil on gentle slopes, or up to a sustained slope of eight to ten per cent, is tillable; slopes to fifteen or twenty per cent are suitable for grazing. Steeper slopes or soils broken by ledges or boulders are unsuitable for any agricultural development.

(2) Physical Character of the Soil.—The physical character of the soil determines its moisture and fertility-holding capacity, as well as, to a large extent, the cost of bringing area under crop. It is more important than soil fertility, because fertility may be increased or destroyed by the manner in which the clearing and cropping is done, but the texture of the soil cannot be changed. We have, therefore, divided our soil into five types on this physical basis, viz., clays, clay loams, sandy loams, sand soils and swamp soils.

The clay soils are composed almost entirely of clay with their humus content. They are heavy, often wet, and without drainage; frequently, they will bake when under cultivation.

Clay loams are lighter soils, containing a heavy percentage of clay, some sand and humus. They are usually well drained, easily worked, and form our most desirable soils, as they do not need the initial expense of sub-drainage required by the heavy clays.

Sandy loams are the same as clay loams, but here the sand predominates. While they have fair fertility-holding capacity, especially if we have a more compact sub-soil, they are liable to respond quickly to periods of drought, and the crops become burned. Owing to the easily worked nature of these soils and the early warming up in the spring, they are desirable for intensive cultivation, but can be classed only as "fair" to "poor" for general field crops.

Sand soils consist of sands, or very light sandy loams with sand subsoils. They exist extensively on the Miramichi, and constitute what is termed the hungry or leachy uplands of the coal measures. Owing to their open, porous nature, all fertility is washed down below plough depth, and they lack both plant food and moisture.

While they can be farmed under intensive cultivation, with copious applications of fertilizer and an artificially controlled water supply, they are undesirable for the production of general field crops.

Swamp type soils are the undecayed or partially decayed vegetable matter of swamps and caribou barrens. They lack plant food, are poorly aerated and generally sour or acrid in reaction, always wet and, under existing conditions, are non-agricultural.

To be a profitable agricultural soil, the crop return must pay, at current rates, the cost of labour required to produce the crop, plus interest on the initial valuation of the land and on the capital required to put this land in a state of cultivation.

Roughly speaking, therefore, clay loam, clay soils and sandy loams can be classified as agricultural land, unless there are excessive quantities of surface or subsurface stone, or the cost of drainage is excessive.

Personal Factor in Agriculture The third factor influencing the success of agriculture is the personal, and much of the success or failure is due to this factor. Frequently, failure is due to lack of understanding of the basic principles of agriculture, sometimes due to neglect to carry out those principles. The man who takes grain crops, year after year, without rotation, rest or fertilization, is mining his soil of its fertility, just as surely as the miner is mining his vein, and, sooner or later, must meet crop failure and soil exhaustion. Many of our abandoned farms are due to this personal element, and there is no doubt that if our early settlers had had someone to direct their efforts along logical lines, we would now have many prosperous communities where we have only waste land. This, however, is a question of education, and one which bears on the survey only in so far as results, some years hence, may be seen on lands classified as agricultural.

The personal factor, however, to a large extent determines the revenue required from the land. Some men are content to take a very small rate of interest on the capital charge, even a small wage for labour performed, because of personal appreciation of the site, family ties or other enhanced personal value. This, however, does not affect the opening up of new settlements for general colonization, and is only met with in cases where new land is required to take care of the overflow of older settlements.

The Social Factor Modern civilization requires social life, and a farmer, as a part of our modern civilization, requires within his reach schools, churches and neighbours. These can be had only where land enough is opened for settlement to

Photos courtesy P. Z. Caverhill.



FIRE TRAP IN THE FOREST

No amount of water available would quench a fire once started in such debris.



FOREST AREA AFTER LOGGING

Dangerous slash condition. After taking out spruce and poplar logs.

permit of a community. This has a distinct bearing on the classification. For instance while isolated areas of good soil may occur, distant from any settlement, and where social facilities cannot be had by our future settler, it is not desirable to classify such land as agricultural, and open it for settlement, even though it could produce paying farm crops. On the other hand, relatively poorer land in the vicinity of established settlements should be classified as agricultural, provided its occupation will strengthen an existing community.

Just a word as to the use the information gathered will be to the Department of Lands and Mines in the future management of the Crown lands.

(1) It will give definite information of the quantity, quality and value of the timber on any area, from which a very close appraisal of the stumpage can be ascertained; it will show whether the department is receiving full value for the lumber cut or not, and stumpage rates can be adjusted accordingly. It will show the quantity and quality of species now of little importance because of lack of market demand, and we hope we will be able either to show that these species can be marketed profitably, or where the quantity justifies it, to induce industries utilizing these inferior species, to operate within the province, thus profitably utilizing material which, at present, is going to waste.

(2) The estimation of growth will determine whether or not the annual cut can be increased, or whether, to perpetuate the industry, restrictions should be placed on certain species to regulate the cut.

(3) The base map, showing as it does the roads, creeks, swamps, and main topographical features, as well as the types, will be a great aid in planning and carrying out any scheme of protection.

(4) The information on soils will permit of directing settlement to districts offering the greatest prospect of success, thus protecting both the future settler and the timber licensee, the latter at the present time having no assurance that portions of his license will not be taken from him under the Labour Act.

In conclusion, I would point out that, with the completion of the survey, we have not reached our ultimate aim. The soil conditions and topography are fixed and permanent. The timber conditions, however, are constantly changing. Therefore, as new areas are culled, as new fires occur or burned areas come again into maturity, it will be necessary to revise our maps from year to year. This calls for a permanent outside organization, to inspect and report on all logging operations, to submit detailed reports on all fire and

bug-killed areas, and, in general, to keep the office in touch with the actual changes in field conditions. It is hoped that, in the next year or two, our fire rangers and scalers will be welded into a permanent organization, which will give us sufficient force to carry out this work. We will then have available information showing the actual condition and value of any area of our public domain at any time, and be ready to deal with any question of policy that may arise.

DISCUSSION

Senator EDWARDS: Would you include all clay soil as agricultural?

Mr. CAVERHILL: Unless there is need of drainage or excessive quantities of stone, which will add to the cost of clearing.

Mr. SNOWBALL: How many parties had you out during the past summer, and how many in each party?

Mr. CAVERHILL: About three parties, of from four to nine men. One party had nine men. We had a forester, a technical man, at the head of each party.

Mr. SNOWBALL: What experience had the forester, the head man in each party?

Mr. CAVERHILL: With the exception of one case, he was a graduate of a forestry school with several years' experience in cruising.

Senator EDWARDS: That is, before he studied?

Mr. CAVERHILL: No, after he graduated he had several years' experience.

Senator EDWARDS: With whom?

Mr. CAVERHILL: In one case with the British Columbia Government; in other cases for private parties. One man who took charge of a party was Mr. Roy, a land surveyor, but the second man in his party was a graduate of a forestry school. We did not put the graduate in charge because we did not think he had had sufficient experience in handling men.

Mr. SNOWBALL: What was the experience of the other men in the party?

Mr. CAVERHILL: The second man was either a graduate or an undergraduate with three years' training in a forest school and several summers in the field, and the other men were woodsmen and men picked up locally. The parties marched in threes. Usually a second-class man went ahead with the compass, and another second-class man calipered one side of the strip; the main cruiser calipered the other side of the strip.

MR. SNOWBALL: Did you chain?

MR. CAVERHILL: We chained most of it. The compass man dragged the chain after him and one man snubbed behind.

MR. SNOWBALL: And the calipering was done by a forester?

MR. CAVERHILL: Yes on one side, and on the other side by a lumberman or one of the farmers in the vicinity.

MR. SNOWBALL: Did he call to the head man the record, or who recorded the record?

MR. CAVERHILL: The compass man recorded the records, the chief cruiser kept the topographic notes and the notes on the logging conditions, conditions of slash, etc.

MR. SNOWBALL: When they bored for growth did they bring the borings out?

MR. CAVERHILL: No. They were measured in the field, as it would be impossible to bring them out. The contraction due to drying would throw the record out of proportion.

MR. SNOWBALL: They did not bring you any for inspection?

MR. CAVERHILL: I was in the field a great deal when the boring was going on, which this year was a small matter. A party of two men will make two hundred borings in a day, and we only made 2,500 borings in the season.

MR. SNOWBALL: What volume tables did you use?

MR. CAVERHILL: As far as we could, we used Bradley's.

MR. SNOWBALL: Did Prof. Miller not prepare a volume table?

MR. CAVERHILL: Yes he prepared some; but they were based on only a small number of trees; where possible, however, we used them. We could not use them in the north, because the timber was of a different character than that on which they were made.

MR. SNOWBALL: What were Bradley's volume tables based on?

MR. CAVERHILL: On the New Brunswick Company lands and they were the same as used on the Tobique.

MR. SNOWBALL: Would they not be liable to be excessive?

MR. CAVERHILL: I do not think so. From our checking we found them about the same as the trees we were working on, and measuring. Then we took them as the basis, and checked constantly; when we found that they overran, we reduced the volume tables accordingly.

MR. SNOWBALL: How do they compare with Prof. Miller's tables? Were they greater?

MR. CAVERHILL: A little. While Miller's tables worked on the Miramichi, we found Bradley's best in the north.

MR. SNOWBALL: Was your survey all done in the north?

MR. CAVERHILL: No. Part of our survey was on the Miramichi. There we used Miller's tables, but often we reduced them. When you get my report you will find quite a difference on the two sites of the Miramichi. On one site we had timber twelve inches in diameter, some of it seventy feet high and on the other the same timber was only forty feet high.

MR. SNOWBALL: How would you account for that?

MR. CAVERHILL: On the Bartholomew, some of it was short stuff, which came up after a fire. The taller stuff was the natural growth after logging. Taking the north, the twelve-inch to fourteen-inch stuff ran sixty-five or seventy feet, consequently, we could not adopt any volume table to conditions all over the province. For that reason we changed our volume tables and checked and adjusted in every locality. We used local tables too.

Senator EDWARDS: How much will the cost be per acre?

MR. CAVERHILL: Our cost per acre this year was four and one-quarter cents, about \$27 a square mile. That included both field and office work in preparing maps, and also compiling final figures, down to an estimate by watershed.

MR. SNOWBALL: You must have had your help at a very moderate rate. I am not criticising you for doing it; I am glad to see it, as generally governments pay a high rate for help.

MR. CAVERHILL: We paid the regular wages the lumbermen down there pay for their help of the same character.

Prof. SHUTT: I am interested in the question of the soil survey. We did probably the first work in New Brunswick ten or more years ago, in determining, from a large number of samples, whether areas reported on should be opened for agriculture or reserved for lumbering. We were not able to satisfy the very large demands of New Brunswick and suggested that the province make a survey. This question of soil survey has been frequently discussed in Canada, and the success of what has been done has been splendid. It would be desirable to follow in the lines of our friends to the south in this matter. Therefore I desire information as to what this soil survey consists of, as to the frequency with which the soil samples are taken, how they are taken, to what scale, and also to what laboratory methods of analysis they are subjected, that we may know in the future what weight to place upon the results and reports of the surveys.

MR. CAVERHILL: So far as the taking of samples is concerned, we make a digging every twenty-five chains on each strip; that is, one on the corner of every block one hundred rods square. Then all diggings are examined in the field.

Photos courtesy P. Z. Caverhill.



HOMESTEAD ON WHICH ENERGY IS WASTED

A poor sandy soil and the presence of great quantities of stone make farming on this area hopeless.



DESERTED NEW BRUNSWICK HOMESTEAD

Spruce reproduction invading old fields on a farm which should never have been settled upon for agriculture.

The diggings are usually twelve, fourteen or eighteen inches deep, depending on the character of the particular stratum of soil. In a large part of the Miramichi watershed, we get from eight to twelve inches of pure grey sand under possibly half an inch to one inch of partially decayed forest litter. Under such conditions we consider it useless going deeper because that grey sand makes the land unsuitable for agriculture. Where there are better soils, and a possibility of something below, we go to 14 or even 18 inches. Our field men give the character of the humus, forest litter and the first layer, three to four inches, whether sand or what it is, and so on down to plough depth. In this matter we have had co-operation with the Conservation Commission. Mr. F. C. Nunnick, of the Commission, and Mr. W. L. Graham, of the Dept. of Agriculture, brought back samples to Ottawa, had them analyzed and submitted a report to us. Their report corresponded exactly with our reports from the field.

That represents the laboratory work done on them, thus far, but, next year, we hope to get an agricultural expert to come down again, or, possibly, to employ an agricultural expert to go over certain of these sections to determine the real value of the land for farming purposes. At the same time we will try to have an agricultural expert go over and re-classify the land and determine any questions of doubt which arise in connection with our surveys.

DR. SHUTT: You have no means of distinguishing between clay loam, etc?

MR. CAVERHILL: Except by the one distinction between clay loams and sandy loams. The distinction is very arbitrary there.

Senator EDWARDS: Are you likely to undertake an investigation as to the advisability of converting a large amount of land in New Brunswick from attempted farming into forests?

MR. CAVERHILL: I am not in a position to answer that question.

MR. SNOWBALL: You say you took up the question of the cost of driving from certain localities to the mills. How do you get that information?

MR. CAVERHILL: We tried to get it from the lumbermen but we found them very conservative, and hard to get information from. In a few cases we have found out the number of men employed, and, knowing about the average rate of pay and the time for which the men were employed, we got close to the cost of the driving. The cost of driving, of course, depends on the season, and varies. The logging is different. The cost of logging is pretty generally fixed.

Report of Planning and Development Branch

BY

THOMAS ADAMS

Town Planning Adviser, Commission of Conservation

IN presenting the report of the Planning and Development Branch for the past year, I have divided it into two parts, Part I being a résumé of the work of the branch for 1916, and Part II containing a brief statement regarding the planning and development of land.

PART I—WORK OF THE BRANCH DURING THE PAST YEAR

During the year we have made substantial progress. Part of that progress has been made in spite of difficulties produced by the war but part, rather significantly, has been the result of a new outlook created by the war itself. The effect of that new outlook will be best seen when the war is over, when the need for conservation and development will become acute. At a time when the country is at war I have felt it to be my duty to emphasize the economic aspects of planning in town and country. It is of vital importance to the country, both as a means of building up economic strength during war and of making preparation for the period of re-adjustment and development after the war, that we should plan land with the definite purpose of securing better living conditions and more production. In cities and towns, where financial conditions are serious and land speculation has led to enormous losses, there is great need for proper planning to obtain greater security and stability in connection with land ownership, closer settlement in suburbs, and a reduction of the extravagant expenditure which continues to be incurred in connection with local improvements. Country or rural planning is also important, in order to improve agriculture and secure the right conditions of settlement. Some of the main objects to be sought by means of urban and rural planning schemes at present may be summarized as follows:

Objects of
Planning
Schemes

1. To plan all land for development and use, and not merely to conform to a uniform geometrical pattern, or to assist speculation.



CAPE TRAVERSE, P. E. I.

Terminus of proposed ferry to connect Prince Edward Id. with the mainland by a short water journey of nine miles from Cape Tormentine. The Island's chief needs are improved means of communication on the Island and better connection with the mainland. The planning of the new town at Cape Traverse is an important matter requiring attention.



PRINCE RUPERT, B. C.

No city has been more carefully planned than Prince Rupert but, owing to want of government control over the development, the value of the planning has been largely nullified.

2. To reduce wasteful expenditure by means of
 - (a) Planning the alignment and width of roads on more economical lines and with proper regard to traffic distribution and topography;
 - (b) Extending street railways according to a proper system of arterial communication;
 - (c) Planning water supply distribution and drainage systems;
 - (d) Regulating building construction and the grouping and disposition of buildings of different kinds to reduce fire loss;
 - (e) Improving transportation and power distribution in connection with manufacturing areas;
 - (f) Revising the methods which cause or encourage excessive land speculation.
3. To improve living conditions by means of
 - (a) More air space around buildings;
 - (b) Proper sanitary regulations;
 - (c) Restriction of certain areas to residences in towns;
 - (d) Greater length of street pavements—but less extravagant construction;
 - (e) Preservation of lands for parks; obtained from owners in exchange for privileges granted to them or purchased at nominal prices only.
4. To encourage new towns to be established in rural districts possessing exceptional facilities for manufacturing or distributing purposes—and the proper planning of those which may be established.
5. To regulate the tendency of manufacturers to remove from large cities to rural areas (especially in connection with hydro-radial and other transportation and power developments), so that the new areas being built upon will be properly planned to secure health and efficiency.
6. To encourage closer settlement of agricultural territory and the creation of new towns and villages on carefully selected sites, so arranged as to give the best and most accessible facilities; to promote co-operation, rural credit and social intercourse, and to simplify and cheapen distribution in connection with agriculture.

Reports to be
Issued

Having regard to the need for a full statement of our aims and policy in regard to planning, I am now engaged in preparing three extensive reports on the above questions. The first will deal with "Rural Planning and Development"; the second with "Urban Planning and Development," and the third with an investigation into the "Housing Conditions of Ottawa." Material has been collected for all these reports and that relating to "Rural Planning and Development of Land" is ready to go to press.

The proposals of the Commission in connection with the above matters have been cordially received by Provincial Governments and Ministers, and by the councils of cities and towns which have been visited. We hope it may also be possible in the near future to obtain the co-operation of the Federal departments interested in the question of land settlement and in harbour and railway developments, so that their influence may be used to secure proper planning and regulation of new settlement in town and country.

Unfortunately, the character and aim of our town planning work is not fully understood, even by many who take an interest in national welfare, and who might be expected to see the merit of proper planning as a preliminary to the proper development and use of land. We have to candidly face the fact that the term "town planning" is not comprehensive enough for our purpose. I have been constantly in a difficulty to make myself understood in intelligent gatherings because of the restricted meaning of the term and the erroneous impression that many people have obtained as to its meaning. In the preparation of the reports on "Urban and Rural Land Development in Canada"—already referred to—I found it necessary to carefully consider this question of terminology, and I have come to the conclusion that we must have a more comprehensive term, in which we can convey something of what we mean.

Meaning of
Town
Planning

What *do* we mean? When we speak of town planning in connection with conservation we must mean the kind of planning that will conserve and develop life and national resources. But that suggests more than planning—it suggests development to follow the plan. Will a mere plan do anything to conserve life? We know that it will not. We know that the plan is only the foundation on which to build and that what matters most is how we build—whether we speak of human



PART OF AREA OF TOWN PLANNING SCHEME, ST. JOHN, N. B.
Showing undulating character of topography. A main arterial thoroughfare has to be designed to intersect this region at easy grades.



Photo courtesy A. L. Handford.

PART OF PROPOSED PUBLIC PARK AT RENFREW, ONT.
The Renfrew Town Council has obtained an option to acquire this park. It is immediately adjacent to the town and contains many attractive natural features.

character, social conditions or an architectural structure. There are cities that are no better because of being planned—because no proper scheme of development was prepared simultaneously with the plan. We prepare rectangular plans for our rural territory in Canada, but we do not plan it for the right purpose, namely, to secure the best economic use of the land and the utmost value from human activity applied to it. We seem to have no purpose other than that of carving out the land in the simplest and most uniform way without regard to use. I cannot enter into the matter fully here but, briefly, the point is this, that town or country planning is not an end in itself, but only a means to an end. That end is the proper development and use of both urban and rural land, so as to secure efficiency, convenience, health and amenity. That is town planning, as it is being thought out and worked out in Britain, and it is in that form that we have adopted it here. Having regard to the need for some elaboration of the present term, I suggest that the word “development” should be used in some combination with the word “planning,” and that we should omit the restricted term “town,” so as to make it clear that we have the planning of rural as well as urban territory in view.

In concrete form the suggested change of terms would be:—
 For “Town planning” substitute “Planning and development”;
 for “Town Planning Act” substitute “Planning and Development Act”;
 for “Town planning scheme” substitute “Development scheme” (urban or rural as the case may be).

Planning and Development	A proper planning scheme is essentially a development scheme—not a mere plan and report as to how things might be done, but a statutory plan and scheme <i>showing how they have to be done</i> . I am persuaded that the above terms would not only more correctly describe what we have in view but simultaneously remove a great deal of misunderstanding. After all, conservation is development; we cannot conserve the forest without developing its young life; we cannot conserve human productivity without developing human activity; we cannot conserve the city or the country without planning for its future development according to the best scientific principles, and having in mind the ultimate aim of perhaps the most important aspect of a conservation policy, namely, to build up national prosperity on a foundation of character, stability, freedom and efficiency of the human resources.
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Any plan must be prepared with a view to that final aim—but it is only an instrument to guide development; it is useless unless it guides it aright; and it is futile even when it guides it aright if it is not put into execution.

As will be seen from the summary below, good progress is being made in getting legislation for planning and development. Much practical work is also being done in cities and towns and town planning services are in constant requisition in different parts of the Dominion.

As we have nine different provinces in Canada, with different forms of municipal government, different personalities to be dealt with, different land conditions and problems, our work may almost be regarded as relating to nine different countries. Yet definite progress has been made in each province in educating public opinion and in advancing towards the time when we will have uniform town planning legislation in Canada.

SUMMARY OF WORK OF THE BRANCH FOR 1916

The following is a brief summary of the negotiations carried out and work done during the past year,—apart from addresses delivered and conferences attended in a large number of cities and towns, including important inter-municipal conferences at Montreal, Toronto, Hamilton, Halifax, London, Kitchener and Vancouver, and the successful Dominion Conference of the Civic Improvement League.

Nova Scotia.—Conferences held with Ministers and with Halifax and Dartmouth local boards regarding schemes. Preliminary work preparing scheme for Halifax and surroundings. Advising regarding a Department of Municipal Affairs, and improvement of highway administration.

New Brunswick.—Preparing St. John town planning scheme, inspecting areas, and attending conferences for that purpose.

Prince Edward Island.—Attended conference with Prime Minister and inspected the Island. A special draft act is being prepared to suit the unique municipal conditions and rural character of the Island. The improvement which is being effected in the means of transportation between the mainland and the Island is likely to lead to important developments in the future.

Quebec.—Revising Draft Act to suit special conditions in Quebec. Interviews with Premier and other Ministers. Organizing and attending conferences and meetings to press for legislation to be passed. Advising regarding housing schemes and town developments in different cities and towns in connection with settlements for returned soldiers.

Ontario.—Conducting negotiations with Ministers and others to secure the establishments of a Department of Municipal Affairs and the passing of a Planning and Development Act for Ontario. The Premier has promised that a Branch of Municipal Affairs will be established and is favourable to town planning. Conferences have been held all over Ontario and petitions sent in pressing for legislation. The Draft Act has been discussed with members of the Government, as well as with the Toronto Civic Guild and other organizations.

Visits have also been paid to a number of cities and towns in Ontario, to advise regarding developments. The most important of these developments is at Lindsay, Ont., where a new arsenal is being erected and a large number of houses are likely to be required in the near future. I have reported to the town council, and advised what steps should be taken to prevent unhealthy conditions being created. I am preparing a plan for the town of Renfrew, at the request of the council, and am supervising the sub-division of all lots in that town. This is being done as an object lesson and the plan will be published to serve that purpose. Kenora, Fort William, Kingston, Windsor, Sandwich and New Liskeard have also been visited.

During the year the report of the Federal Plan Commission of Ottawa and Hull has been issued, but no action has been taken to prepare a development scheme to carry it out.

The preparation of a proper development scheme for Ottawa and Hull, based on the preliminary plan of the Commission—with such modifications as may have to be made—will take two or three years to prepare. The plan cannot be effectively carried out without such a scheme, and any attempt to apply the recommendations in a piecemeal fashion will inevitably meet with failure. Having regard to the fact that the most important part of the work still remains to be done, and to the length of time that will have to be given to it, it would appear desirable that the further work of developing the plan should be taken in hand in the near future.

As already stated, the report on "Housing Conditions of Ottawa" is well advanced, although I regret it has been much delayed by reason of want of time to concentrate upon its preparation.

Manitoba.—A Town Planning Act was passed for Manitoba during the current year. I spent three weeks at Winnipeg, discussing the details of the measure with the Ministers and Legislative Committee. The result was that the Act, which was not satisfactory as introduced in the first instance, was greatly improved after

revision. Draft procedure regulations for the Manitoba Town Planning Act are now being prepared.

Saskatchewan.—As a result of conferences with Ministers, and after some negotiations, a Town Planning Bill was introduced last session and passed its first reading. The question of the future course of the bill has not yet been decided.

Alberta.—At meetings held at Calgary and Edmonton in the summer, committees were formed to take up the question of preparing town planning schemes under the Alberta Act.

British Columbia.—A Draft Act has been submitted to the new Premier (Hon. Mr. Brewster) and has been discussed by local conferences and I anticipate that the matter will receive favourable attention.

General.—*Conservation of Life*, containing original articles on questions relating to town planning, municipal government, housing, etc., has been issued quarterly.

Much work has also been done in connection with the promotion and extension of the Civic Improvement League. Successful conferences have been held in numerous cities, the most important feature in this connection being the formation of local branches, so as to build up a Dominion-wide organization of great strength. Under the influential guidance of the Hon. Sydney Fisher an active branch of the league has been formed in Ottawa, and two of the strongest local leagues in the Dominion have been organized in Winnipeg during the year.

A questionnaire, with 112 questions, has been distributed to 200 municipalities, asking for information on economic and municipal questions, with a view to enabling me to prepare the report on "Urban Planning and Development," and to supply municipalities with comparative information.

Conclusion.—The foregoing is a general résumé of the work done. It is varied in scope, and covers a wide field—architectural, engineering and legal; because of this it is difficult to accomplish all that is needed with our present staff. Moreover, having to act in such varied capacities diminishes the amount of work done in any particular direction.

In the immediate future I have to deal with the following matters, in addition to the routine work of the office, extensive correspondence and constant negotiations with local councils and others:—

1. Completion of reports on *Rural and Urban Planning and Development*, and *Housing Conditions of Ottawa*.

2. Completion Model Town Planning By-laws for Nova Scotia and Manitoba.
3. Drafting Housing Act and memorandum setting out principles of Act to Create Department of Municipal Affairs.
4. Preparation of plans of Halifax, St. John and Renfrew. Preparation of plans and schemes of development for new towns about to be built by pulp and paper companies in different parts of the Dominion.
5. Negotiations and conferences with the object of getting Town Planning Acts passed in Quebec, Ontario, Saskatchewan, British Columbia and Prince Edward Island.
6. Arranging deputations to governments to press for legislation.

It is of interest to note that the revised draft Town Planning Act of the Commission has been used as the basis for similar legislation in Australia, and that the Massachusetts Town Planning Boards are trying to get legislation adapted on similar lines and have asked my advice as to how to proceed.

During the year I have made a report to Lady Aberdeen on the competitive plans of Greater Dublin, Ireland, and have conferred with Lord and Lady Aberdeen regarding the programme of work of the National Council of Women in connection with after the war problems.

PART II—LAND PLANNING AND DEVELOPMENT.

In the first part of this report I have dealt with the activities of the Commission in regard to the planning of urban and rural land for proper development and use. In this part I propose to deal briefly with some aspects of the problems with which we are confronted in Canada because of a combination of circumstances, of which the war is one. As already stated, these problems are being made the subject of more exhaustive reports than it is possible to present to this meeting. Two of these reports are the results of a request made by the Chairman of the Commission, that a special study should be made of problems relative to development and improvement of industrial conditions in Canada, to colonization and to the use of urban and rural land in general. An attempt was first made to prepare a condensed report for this meeting but the subject proved too large for that purpose. Only a brief presentation of some points from these reports can be made.

Canada's Task
After the War

Whereas, the task of Europe after the war will be to restore and reconstruct, the task of Canada will be to conserve and develop. We are at the opening of a new era of social construction and natural expansion, and the question is not whether we will grow, but how we will grow.

There are four urgent needs on which emphasis should be placed:

1. The proper planning and development of land for purposes of efficiency, convenience, health and amenity, instead of for purposes of speculation.
2. The stimulation of scientific training and improved educational methods, particularly in the rural districts.
3. The improvement of the government organization, especially of that dealing with municipal affairs.
4. In rural districts, the provision of facilities for social intercourse, co-operation, rural credit, and the development of rural industries.

As Planning Adviser to the Commission, I am primarily concerned with the first of these matters and only incidentally with the others.

Our natural resources in Canada are practically unlimited, if we can obtain sufficient human activity and human ingenuity to convert them to use. Our means of distribution by rail are more than adequate for years to come. But, in reality, these resources are seriously limited and inadequate in proportion as we lack the population to adequately work them. We may as well not have the resources as not have the human activity to convert them to human use. But productivity depends more on quality than on quantity of population—more on intelligence and organization than on numbers. Conservation of life, in so far as it implies the development of the qualities of efficiency and of the capacity to make the best economic use of the resources on the part of the people, counts most largely in increasing production. To secure that conservation our first task is to apply scientific methods to the planning and development of land, which is our greatest natural resource. We must aim not only at getting results, but at getting the right results.

Value of
Free
Homesteads

The offer of free homesteads as the sole means of attracting settlers is of questionable value as a public policy, especially when it leads ultimately to speculation and absentee ownership. Ownership of land in France and Belgium has prevented emigration, because the owners in these countries had co-operative facilities and means of enjoying social intercourse, and because rural manufacturing industries have been carried on in combination with intensive cultivation. It is certain



A STREET VISTA, CHARLOTTETOWN, P. E. I.

The Parliament Buildings at Charlottetown stand in the centre of a large square and close the vistas of the approaching streets. Both the buildings and the streets gain as a result.



CHARLOTTETOWN APPROACH

Charlottetown, P. E. I., is a well planned city on the whole, but it has a poor approach from the railway station. The proper position for the station would have been on the side occupied by the round house on the right of the picture. Owing to bad planning of the railway terminus the city has to be entered by a "back-door."

that, in regard to the magnet of ownership, Canada will suffer from wider competition after the war in English speaking countries, and the prospects of obtaining immigration from such countries will be small unless, in addition to free homesteads, we can offer improved facilities for co-operation, distribution of products, carrying on of rural industries, education, etc., all of which can only be provided if land is planned to secure better means of communication and closer settlement, and if more encouragement is given to the producer and less to those who exploit the producer.

Improved Rural Conditions Required Particularly in the rural districts, improved education, good roads, more efficient local government, co-operation, social intercourse, rural credit and rural industries are all dependent on better planning and closer settlement. Hence, in logical order, better planning for right use comes first, although the comparative degree of importance to be attached to it and the other things may be a matter of opinion. We have a many-sided problem that requires many-sided treatment, and we want a proper sense of proportion rather than emphasis on a particular remedy.

We plan at present for simplicity and accuracy rather than for efficiency and convenience. The economic use of the land is no more considered in fixing boundaries than its topography, yet both need to be considered. We require land classification and discretion to plan the smaller units within the township boundaries in new territory, and even to replan some of the old territory. We want better roads in the right places and fewer of them. We require to plan road alignment and widths to save wild extravagance in road construction. The Deputy Minister of Highways for Ontario estimates that good roads in Canada would yield us a profit of \$50,000,000. Injurious speculation needs to be arrested in town and country. Sir James Aikins, Lieutenant-Governor of Manitoba, estimates that 30,000,000 acres of land near the railways in the western provinces is lying idle, and meanwhile we are trying to attract new population to territory that cannot be economically worked without more railways and more roads. At enormous expense we have provided equipment for the next ten or twenty years. To put that to economic use is more important than to add more equipment, to the injury of both ourselves and prosperity.

Assessment and Taxation Our methods of assessment and taxation require revision. In some parts of Canada we tax the rich man on the basis of 5 per cent of the value of his property and the farmer and poor man on the basis of 100 per cent.

This is our direct taxation, and has nothing to do with tariffs. Planning of land should lay the foundation for a right basis of taxation. And there can be no equitable system of taxation which ignores the use to which land is put. In some cities from 60 to 89 per cent of the sub-divided lots are vacant, and taxes are being paid on these lots out of productive industry; huge sums have been spent in providing local improvements for many of these lots, and it is not surprising, therefore, that taxes in some cities in Canada are a hundred per cent higher than in cities of a similar size in England. So heavy is the burden on the owners that there are millions of arrears of taxes alone. We pay the price for good sanitation and get bad sanitation; we have the best and most costly fire fighting organizations and pay from \$2 to \$3 per capita more than some other nations for fire insurance. One-third of the deaths from tuberculosis on this continent occur between the ages of 15 and 60 years, the best working years of human life, suggesting great economic loss. Rural depopulation is still going on at a serious rate, and in some old counties farms are unoccupied and schools are nearly empty.

This is not as it should be, not as it need be, and nothing is to be gained by ignoring the facts, nor is much to be gained by irritating criticism of past mistakes. What is required is action to make things right. A higher value must be placed on our human resources, and less on the sanctity of the kind of prosperity that thrives as a result of injury to these human resources.

	Is the problem too great to deal with effectively?
Use Local Authorities	It is, if we try to plan a continent from Ottawa or a province from Toronto. We must plan, first, to secure right development, and settle the principles and procedure by central governments; <i>but we can only succeed if we place greater responsibility for administration on our local authorities.</i> We do not use our local authorities enough; we do not trust them enough. We must think in terms of national prosperity, but must plan for that prosperity in small units under expert guidance from our provincial governments. That is a principle underlying planning and development legislation—the determination by the central organization of the general policy and procedure and of the framework on which to build together with the preparation and working out of details by the local councils.

A similar method requires to be employed in dealing with such problems as those concerned with the returned soldiers. Local knowledge and local organization should be more fully used. Are we to ask the returned soldiers, *i.e.*, such of them as want to go on



MAP OF CITY OF ST. CATHARINES, ONT.

This is a proper city map and shows the existing buildings and natural features. The more common map of sub-divisions is of little value for city purposes and is misleading.

the land, to go through the process of disappointment which has killed the spirit of so many settlers? We have to find out the causes which have led to that disappointment and remove them. If these causes are not to be found in our haphazard methods of planning the land without regard to the purpose to which it is to be used, or to the necessity for closer settlement to secure improved facilities for distribution, co-operation, etc., then we must find the cause and apply the remedy.

All planning must be made with due regard to the interdependence of rural and urban life, and to the fact that no system of land settlement is sound which cannot submit to the economic test.

But the conservation and organization of natural growth in rural and urban districts is only part of our task. A constructive policy to create new spheres of labour and new centres of production is not beyond our capacity.

Healthy Con-
ditions are
Good Business

Great manufacturers are to-day selecting new sites for towns in Canada, where they can get cheap and ample power, and convenient access to the raw materials of their industries. They are planning and laying out these towns in a healthy and efficient way, because they recognize that it is good business. Is it beyond the power of governments to take more direct interest in the proper location of new towns, instead of leaving them to chance growth in the wrong places; to investigate natural opportunities and to estimate new industrial growth? It is not so in the case of private corporations that have no public responsibility, and it should not be so in the case of those who are entrusted with the great task of building up a nation.

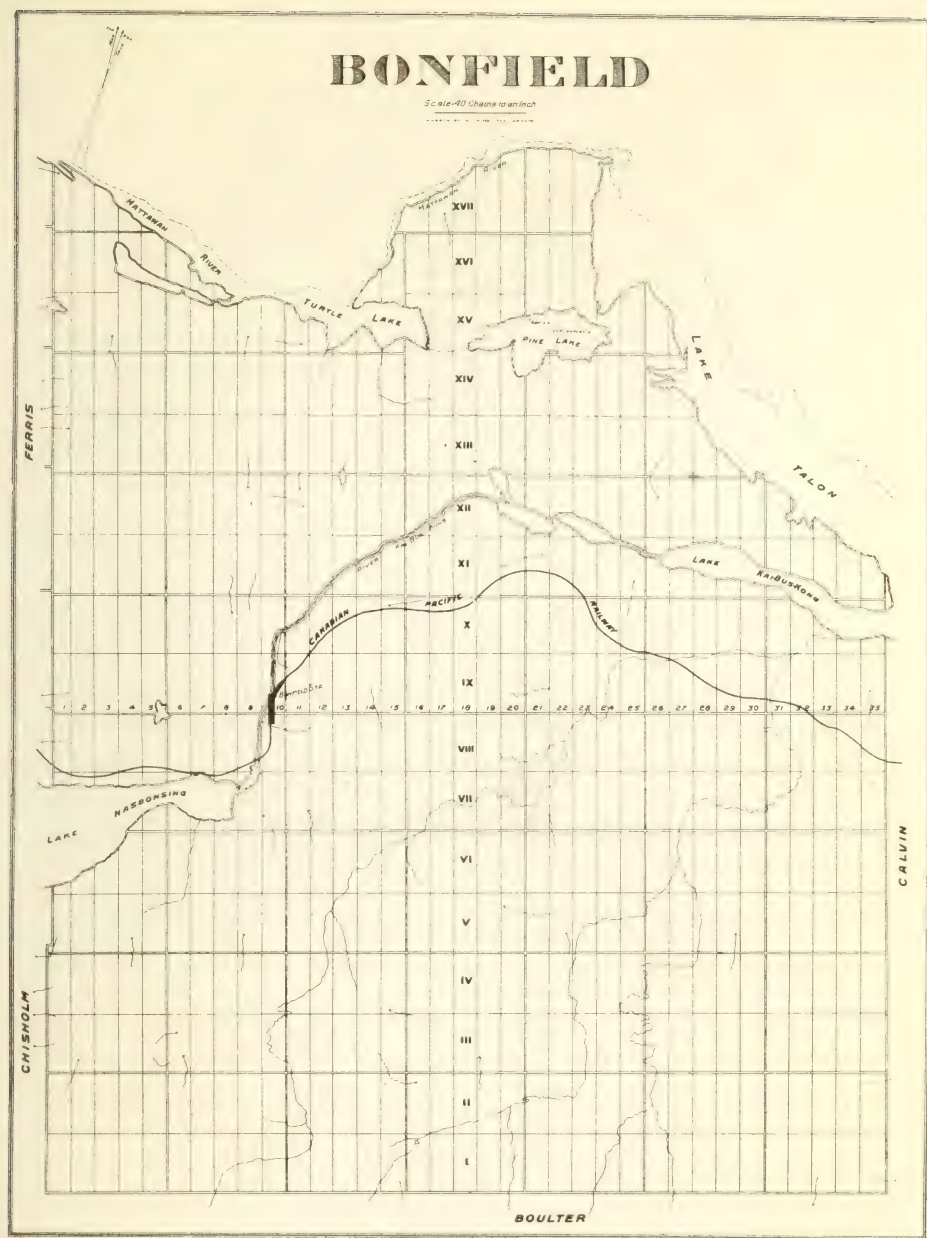
In conclusion, I would like to give one illustration of the kind of scheme for laying out new towns to which I am giving attention.

There is a piece of forest land in northern Quebec, where there are very large lumber interests. A site has been acquired there by a large pulp and paper company, with the object of erecting a mill and creating a new town. The company did not instruct a surveyor to go down and subdivide the townsite into square blocks. They came to us and asked advice as to how best to plan this town for the purpose for which they wished to use it, that was, to make it a healthy place of residence for those employed in their works. As a striking illustration of a fact, not usually appreciated by those who look upon improvement of conditions in our towns as sentimental, the manager of that company has said that he offered engineers double the salary they were receiving to go to a certain town in Ontario, but they all refused, giving as a reason that the

living conditions in that town were not suitable for their families and themselves. If it is so for the men at the head, is it not equally or more so for the workingmen? You get the worst workingmen in the undesirable towns, but you can attract the best in proportion as you give them decent surroundings and conditions. This fact has been so impressed on those developing this large industry that they are having the town laid out on model lines in accordance with a plan which we are preparing. This company is proceeding in the right way. The site was first carefully surveyed, and the character of the topography ascertained. It is proposed to have the mill and lumber yards on the level where the facilities are best for collecting and sorting the lumber, and the town has to be laid out on the side of a hill. It is proposed to build a town for three or four thousand people on the heights. At first we did not consider the question of subdivision of land at all. We considered the general levels, the location of the power station, the facilities for drainage, the best grades and the lines of streets. The sub-division is one of the last things to think about. As far as possible, we will endeavour to centralize the heating, and make this a model town for the purpose for which it is intended. There are two possible ways of heating: One is to supply the heat from a central station; the other, to have Quebec heaters and arrange the heating for each separate house or group of houses. The question is yet to be settled. The great advantage of central heating will be the economy of space and reduction of labour. Whether it will be possible to have electric cooking, owing to the cheapness of the power, is another matter yet to be decided. We do not want the men who will be living in this town to be burdened with too great a cost for advantages which, while desirable, may yet be beyond their means, but we want the best they can afford. We should encourage this tendency of manufacturers who are moving out from large cities—to plan these new sites so as to secure health and efficiency. What private individuals can do and are doing—and this company is not acting alone in this matter—should be possible for governments. The Commission does not, of course, undertake the laying out of towns generally, but we are doing this for the purpose of creating an object lesson.

DISCUSSION

DR. FRANK D. ADAMS: I wish to say a few words supplementing what Mr. Adams has said regarding "scientific planning" and the laying out of roads independent of physical features. I think, perhaps, one of the most striking examples of how this may be done, to the great detriment of a community, is a case actually



AN ONTARIO SUB-DIVISION

The rectangular survey of Ontario is one of the best systems of survey for purposes of measurement. But it is not a proper plan of the land for purposes of use. It ignores topography, and, like all stereotyped plans, is unscientific, and is injurious to land development.

perpetrated in the province of Ontario towards the beginning of the last century. At that time the Government of Upper Canada decided to open up the county of Hastings for settlement, and to build a colonization road. This road was started from Madoc, and was to run straight to the Opeongo river. The line of a colonization road was laid down on a map which represented in a very general way the outline of the Opeongo and the country between it and Madoc. Then a surveyor was instructed to lay it out, but was directed not to depart more than one hundred feet from that line. North of Madoc township, the road traversed country not very good for agriculture, and quite rocky. Between the fifth and twenty-fifth miles it crossed three large masses of igneous rock, two to three miles wide, 600 to 700 feet high, and absolutely barren. This road crossed each one square in the middle, and, for three-quarters of a century, every pound of lumbering supplies for six of the most prominent lumbering firms in this portion of Canada was hauled up and down these frightful hills and over these three masses of rock. Then the road continued through a country somewhat like that in which it started until it reached the valley of the York river, where it traversed the bed of an old lake for twelve miles; thence, it climbed a granite escarpment. Beyond, for a considerable distance, it traversed a narrow trench filled with boulders, each about as large as a man's head. When I was there, it was impossible for any wheeled vehicle to go over that road. A couple of oxen with a stone boat might have got through. That was the result of the common disregard of all features of the country in the desire to get a perfectly straight line in a road. When the Central Ontario railway was constructed, it followed the course of a river bed nearby and secured a low grade up to Bancroft, and the Hastings road was practically abandoned.

The Conservation of a Neglected Source of Indirect Food Supply

BY

J. B. FEILDING, F.Z.A.

Late President, British Fish Breeders' Association

THERE is no source of food which requires less labour and, at the same time, absorbs less capital to operate than our fisheries. Nor is there a food supply so valuable to the people at large, if economically marketed, or less thought about, or considered, than our fisheries. Largely for these reasons there is such enormous waste connected with it; this waste, unlike many forms of agricultural and mining waste, is, for the most part, perishable and irrecoverable if left untreated.

Most of our wastes, such as those from agriculture and other industries, are obvious, and come before us in many unavoidable ways. Our fishery waste, on the other hand, must of necessity be created and dealt with either at sea or on the wharfside and, therefore, is only obvious to a few, and, further, it has to be treated immediately or it might become a menace to public health.

Much of our waste is attributable to the fact that we, in Canada, obtain our food too easily and too abundantly. Therefore, wastes of this character, which undoubtedly absorb additional labour, and with which we are not too well supplied, are not made use of.

Public food supply is, however, becoming a more popular subject, and those who have considered many of our industrial wastes as nuisances (if considered at all) now ask if they cannot be made into food for man or beast, and thus relieve the food situation. The *Mail and Empire* of January 3, under the title of "Shortage of feed may prove serious for farmers—Department moves to check sacrifice of breeding stock," says:—

"Unless the present tendency of farmers to sell off their breeding stock, rather than carry them through the winter, is not checked, there is likely to be a serious shortage of cattle, and particularly hogs, in the coming spring and summer. From all parts of the Province reports are reaching the Department of Agriculture that the shortage and high cost of feed is causing farmers to get rid of their stock. The situation has become so disturbing that special steps are being taken to counteract the prevailing tendency."

Does this not call for more than warning and remonstrance? We are rather fond of talking 'patriotism and production' at the farmer, but are we making it more easy to produce. You cannot produce without the basic raw material, which is food—food for the soil and food for the beast. In this connection your Commission some little time ago, instructed me to examine, in a cursory way, some of these wastes.

It is admitted in principle that every industry has its associated waste, and therefore in these times surely food wastes become the most important matters for research.

Value of Fishing Industry	The fishing industry in Canada is valued at something like \$35,860,708, consequently there must be a waste somewhat in proportion to the volume of material handled, or, in other words, commensurate with it. How many realize the amount of it, what it consists of, what it can be converted into, or even what it is worth?
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It is well-nigh impossible to even approximate the amount of waste, but both on sea and land it is colossal. We can, however, make a rough mental estimate of the bulk of this waste, for the average fisherman will admit that twenty-five per cent of his gross catch consists of fish of no economic value on the market, and that of the fish which is landed another twenty-five per cent represents offal and of no value as human food. This may vary somewhat in different waters. J. W. Turrentine, Scientist in Soil Laboratory Investigations, of the United States Department of Agriculture, states that, of the fish necessary to fill one 48-lb. case of canned salmon, an additional 40 lbs. is wasted, nearly half as much as the final marketable product. Further, we are told by Mr. Williams, of Halifax, that a season's pack of lobsters, amounting to 160,000 cases, absorbs 32,000,000 lbs. of fish, of which 25,500,000 pounds is thrown away as waste. The actual amount of human food thus amounts to only 6,500,000 pounds, or 25 per cent of the whole catch. I need not specify other departments of the fish trade, for the story of waste is the same to a greater or lesser degree. The chemical value of the lobster waste is: Carbonate of lime, 9.40; phosphate of lime, 19.60; phosphate of magnesium, 4.26; sand salts of potassium, 1.24, and organic matter 65.50. (The organic matter contains nitrogen equal to ammonia 5.86.) This total must, therefore, be approximately 236,000 tons. It may vary in different seasons, but the estimate is not very far wrong in whichever way it is calculated.

Waste can be
Recovered

This waste is not all recoverable, for that would be a physical impossibility, but a sufficient volume of material of economic value could be put into use to make itself felt in the agricultural and other industries, and at the same time greatly benefit the fishing industry.

There is no question, then, of the existence of this enormous by-product of one of Canada's national industries. What are we doing with it? We already know that valuable oils can be extracted which many industries, such as the soap, paint, lubricating oil, leather, glue and other trades, have to import from foreign countries, while the more solid matter, or residue, consisting largely of protein and other essential constituents, so necessary for the feeding of live stock on our farms, is entirely overlooked. We know also that there are few more concentrated forms of nitrogenous and phosphatic fertilizers at present on the market than that obtained from scrap of degreased fish waste.

A careful investigation into this important problem of conservation would probably cost more than might be available. Many of our legislators are not farmers, and it does not occur to them that, if you provide a new source of cheap concentrated food for farm live stock and farm crops, you are helping to reduce the cost of production to the farmer and, therefore, to the consumer.

Important
Conservation
Problem

No more marked conservation problem of immediate importance, however, could well be discovered, and some real and important work of first rank should be taken up in the near future and thoroughly prosecuted, so as to meet the present crying demand for a cheap beef and pork raising concentrate on the farm, and in this way relieve the existing critical situation.

About the middle of October, under instructions from this Commission, a small research station was opened at Port Dover, on the shores of lake Erie. After some difficulty some primitive apparatus was collected and work commenced; this only was possible owing to the proximity of the closing of the fishing season.

The work was not entirely new since the writer had conducted somewhat similar experiments during the years 1899, 1900 and 1901 with the well known German fishery authority, the late Herr S. Jaffe, one of the chiefs of the German Inland Fisheries. The work then conducted was mainly connected with waste fish brought in from the North sea at the ports of Bremerhaven and Wilhelms-haven. The material at those ports would be somewhat different from that at Port Dover, but, having no knowledge of the chemical



UTILIZATION OF FISH WASTE, PORT DOVER, ONT.

The refuse from which much valuable material was secured.



UTILIZATION OF FISH WASTE, PORT DOVER, ONT.

Rendering room where the fish refuse was treated to secure the valuable oil content.

constituents of the waste on our Great lakes, and there being no time to conduct research in that direction, we proceeded along the same lines as in Germany.

Composition of Fishery Waste

The composition of the fishery waste of the Great lakes is practically the same on all Canadian inland waters, though it may vary from month to month in its oil content. This waste consists, for the most part, of the viscera or guts from the whitefish, lake herring, lake trout and other fish that are cleaned for market, as also of undersized fish not legally allowed on the market, and fish of no marketable value.

In dealing with this waste, coming in fresh every day, we handled it entirely as a food. We were aware that it contained a larger quantity of oil than was necessary, or desirable, in a food, so we extracted as much as possible with the rough apparatus at our disposal. This oil came away quite freely at 212 deg. F., while it boiled at 361 deg. F. Very little more oil was obtained after boiling for two hours than at the end of one hour. By the use of a press more oil might probably have been extracted, but it is doubtful if the quality would have been as high. These oils which are still being examined, are somewhat complex in their composition, and a conclusion has not yet been arrived at as to what purpose they are best suited. They are very difficult to bleach, though very easily refined in other ways. They are very delicate and easily charred in the digesting process, and, as far as we could see, the stearin or heavy fat content is high.

After extracting the oil in this somewhat rough and ready manner, we evaporated such water as remained in the solid residuum in a drying kiln. The dried material was then passed through a grist mill to reduce it to a fine meal, which was practically free from any offensive smell. This fish-meal was then put aside until sufficient had been accumulated to compound the live stock feeding stuffs we had in view.

Production of Fish Meal

It may be asked why we did not consider this fish-meal a finished commodity, as the packers consider "beef scrap" and "tankage" a finished article of commerce. The materials are so different to handle and store in actual practice that it had been found from previous experience that it was not advisable to leave fish-meal, as such, in this form too long. Only last week we purchased from a small fish reducing plant some fish-meal that was supposed to have been made according to our instructions. Though the weather had been cold, this meal on arrival proved for the most part to be useless as food, owing

to the fact that sufficient water had not been evaporated, resulting in heating during transportation over a distance of only about 100 miles. The material is extremely delicate, and fatty acids are easily generated in storage, so that the whole material becomes not only unpalatable, but also unsuitable as a protein concentrate for live stock; this object, of course, was our chief aim.

Many experiments in 1899 were conducted along these lines to ascertain in what form fish-meal could be stored best, and, after spoiling much material, the conclusion was reached that to prevent this change taking place, the sooner fish-meal was compounded with other materials the better. Many of the products, we found, required a second cooking in the compounding process, and this we followed out at Port Dover, excepting in the case of a cattle feed, which was compounded dry with certain mill by-products and other materials.

Fish-meal, as such, while not new to agriculture, has seldom been brought before the farmer as an agricultural commodity either in England or America. Germany is practically the only country where this material has been carefully studied and is now largely used in the agricultural industry, and Germany not only consumes all of her own fish waste, but, before the war, imported from England somewhat over 18,000 tons a year.

Cattle and
Hog Feed

After careful examination of the material at the Port Dover station, we compounded a cattle-meal concentrate consisting of 75 per cent pure fish-meal, a hog feed of the same strength though differently compounded, a poultry scratch feed in balanced ration form and as a substitute for grain, and a dog biscuit which should compete with those now imported into this country in large quantities.

These foods are now being examined by Dr. Shutt, the Dominion chemist, and actual practical demonstration is being carried out under the direction of Mr. Grisdale at the Central Experimental Farm in Ottawa. In asking Dr. Shutt and Mr. Grisdale to examine these foods we have put them to great inconvenience, since they had already made arrangements for their winter work. Our excuse is that, since this food is now going to waste, and is much in need, this research is vital at the present time, and calls for a little forbearance on all sides. It is impossible, therefore, to report at present on the actual food value of the waste made up.

These foods may be found not to have been properly compounded, that is, in correct proportions, as the system adopted was that followed in the North Sea experiments in 1899, which may not be applicable to these inland fish. The compounding, however, can

be easily altered, if necessary, to suit the requirements when we find out the market possibilities and climatic influences on the material.

Fish-meal as a food comes within the same category as packers' beef scrap. As a concentrate it has other advantages, chief of which is that of containing phosphate of lime; further, the protein and fats appear to be more easily assimilated by mammals than the proteins and fats of vegetable origin, such as linseed and cotton seed. Unlike beef scrap, it can be used to advantage as a feed concentrate for herbivorous mammals, such as cattle, sheep and horses, owing to its easily digestible character.

One of the leading horse breeders in this country recently stated that he had for many years given cod liver oil to his breeding stud with wonderful results, and had used it also with much benefit to his sheep.

It may be well to epitomize the history of fish-meal to show that its use is not new to agriculture, particularly in transatlantic countries.

Fish-Meal as a Food

The most recent work in America on the use of fish-meal as a food for farm live stock is by Mr.

F. C. Weber, of the United States Department of Agriculture. This gentleman has done some extremely valuable research work. His paper, *Bulletin No. 378, United States Department of Agriculture*, should be read by all interested in the subject of a new reserve food supply. He gives a brief history of former research and results of his own experiments. In discussing the hog feed experiment Mr. Weber says: "Hogs relish it and are extremely fond of it, for, like tankage, it is a flesh product." He found fish-meal was superior to "tankage" in all comparisons in the three lots of hogs experimented upon, and that where fish-meal can be obtained conveniently, at a reasonable price, and in suitable quantity, it has very considerable value in hog feeding; also, that laboratory tests have shown it to be as valuable as any other high protein concentrate with which it has been compared. An enormous field is open to the various fishing industries for the preparation of this valuable material, either from waste residues or from whole fish. For farmers, stockraisers and poultrymen, also, an hitherto neglected source of supply of high protein food becomes available.

Experiments on the use of this material for feeding purposes and the feeding tests with the fish meal prepared from sardine waste conducted by Mr. Weber, dispel all doubts as to the feasibility of using fish-meal as a food, and it is expected to become one of the leading protein concentrates used as a supplementary stock food.

Mr. Weber further says that there is a great need and a splendid opportunity in the market for fish-meal as a stock food. This is only too true in Canada at present.

To those interested in using the product, Mr. Weber says fish-meal is as valuable as other widely used high protein feeding stuffs, while in some instances it has been proved more valuable. It does not impart its flavour to animal products, if fed in reasonable amounts in conjunction with other feeds, and should be carefully considered when a high protein food stuff is required.

Superior Quality
of Fish Oil

Mr. Weber also states that, due to its superior quality, the fish oil produced in the manufacture of fish-meal is destined to be a valuable article.

At its present price the oil obtained during certain periods of the season is sufficient to defray the entire cost of manufacture of the dried meal. This has been proved in Canada in one small factory.

Animal oils are getting scarcer, and manufacturers formerly using them are compelled to adulterate with the cheaper vegetable oils, indeed, even using mineral oils. At present the price of lard is as high as butter at its summer figure. Even linseed oil is \$1.17 to \$1.20 per gallon, while thousands of gallons of valuable animal oil are going to waste for want of proper handling.

G. Martinoli, of the Department of Agriculture of the Argentine Republic, in a report on the utilization of fish-meal, states that it has proved of great value in the development of bone structure and in stimulating the appetite of live stock; he also found that more rapid gains were obtained from the use of fish-meal than from any other meal, and in quality, superior to meat scrap. J. W. Turrentine, in *Bulletin No. 2, United States Department of Agriculture*, states that "the universally affirmative results of all recorded experiments with fish scrap as a cattle feed leave little room for doubt as to its efficiency," and he further states: "It is indeed surprising that its use as a feed has not been generally introduced."

A German authority, V. Schenke, states that the protein present in fish-meal is more easily assimilable by cattle and sheep than the protein in linseed, cotton seed and similar feeds of vegetable origin. This gentleman conducted some very exhaustive experiments, the results of which all went to prove the high digestibility of this product.

Fish-Meal
Highly
Recommended

In the *Report of the British Board of Agriculture* of November, 1914, we find a very strong recommendation of the Board to farmers to use more of this meal, so largely made in England, and hitherto mainly exported

to Germany. The author states that the feeding value of fish-meal lies in its high content of vegetable albuminoids (the albuminoids are about ninety per cent digestible), which renders it especially suitable for combination with roots, potatoes, hay, straw and the starchy cereal grains and mill by-products, which are low in albuminoids. The phosphate of lime and salt, from seven per cent upwards, in the fish-meal is indispensable in the feeding of animals, but naturally an excessive amount of salt is valueless.

Recent English experiments, carried out at the Agricultural College at Seale Hayne, on English-made fish-meal of North Sea origin, proved that the addition of fish-meal to other foods, in the proportion of 14 to 29 per cent, will lead to a marked increase in the weight of pigs so fed as compared with those fed on a diet containing no fish-meal. These experiments showed that the substitution of fish-meal for a certain proportion of other food gives increased profits amounting to 42 per cent per pig in the case of one series, and 94 per cent per pig in the case of another series, despite the higher cost of feeding. The faecal matter from the hogs was of a high manurial value, due to the high nitrogen and phosphatic content. These phosphates were relatively in highly soluble form and proved a quick acting fertilizing material.

In Europe much of this fish-meal is used on fish breeding farms, especially in trout and salmon raising from the earliest stage. Fish breeding is a large industry in Germany, and, therefore, requires a considerable amount of flesh feed of a kind not so likely to promote insanitary conditions in the impounded waters as the meat offals from mammals. This trout food must be carefully prepared, certain fish wastes being excluded owing to the risk of introducing myxosporidian parasites, common to certain marine fish but harmless to mammals. The writer has used fish-meal for this purpose for 20 years.

Fish Waste as Fertilizer

While a few samples of fish waste have been experimented upon as live stock food in Canada, nothing was known of their method of manufacture. Unsatisfactory results have occasionally resulted from the utilization of fish-meal as food, which have militated against it. The cause for this, however, is almost entirely with the manufacturer, who is usually ignorant of the requirements of the market; also, in dealing with a by-product, it is easy to become careless in methods of treatment, thus placing on the market an indifferent, if not an entirely unsuitable product. Fish waste is at present manufactured as a fertilizer in Canada only on a small scale, but it is mainly exported to the United States for further treatment and to be put up in

form acceptable to the farmer. This is a serious loss to the country, for this fertilizer seldom, if ever, returns to Canada.

Raw, dried fish waste has been offered on the Canadian market, but farmers report that it "burns" the land, is offensive to handle, difficult to broadcast or apply to land, too highly charged with oil, etc. To use an agricultural expression, the material is not a "complete fertilizer"; it is only a concentrate, and needs further manipulation, for it is admitted to be better agricultural economy to use organic fertilizers in balanced than in concentrated form. Thus, it has been found that on the average, one ton of fish scrap, properly prepared and mixed with other necessary elements, will make up some three and a half to four tons of 'complete fertilizer.' Other constituents to be added in suitable proportions would naturally be products of potassic, phosphatic and calcic origin.

The conversion of this fish waste into food is of first consideration, however, for there is no doubt that all fresh teleostean fish should be used as such, since it is an established fact that meat and fish wastes, after passing through the digestive tract of the mammal, are more readily assimilable by plant life than if supplied direct to the land in crude form. It is impossible to extract all the oil from fish waste, which is detrimental to the material when used as a fertilizer, except it be passed through the alimentary tract of some animal, which would make use of the oil and return the nitrogen and phosphates in a readily assimilable form to the soil.

Offensive Smell can be Overcome	Users of fish-meal as a live stock food product have complained that the smell is offensive, that it promoted looseness of the bowels, and that it perished very quickly owing to its hygroscopic character. To overcome this the manufacturer should undertake research to discover, as was done in Germany, how best to prepare this very delicate, and, at the same time, very valuable, food resource, to overcome all objections. They can be all overcome—it is simply a matter of chemistry applied with experience.
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The offensive smell is due mainly to the breaking down of the fats; this can be largely mitigated by proper manufacture. In a similar way other objections can be met when the farmers' requirements, together with the conditions under which the food when manufactured is stored, etc., are definitely ascertained.

As in other trades, the manufacturer must do the research work; the farmer has neither the means nor the scientific knowledge to guide or direct him. If the material offered does not produce the results the farmer discontinues its use and advises his neighbours to do the same. The Commission hopes, therefore, to be allowed

to continue this work of research only just commenced, in order that it may meet to some extent the great dearth of protein concentrates at present being faced by the farmer and producer of our national food supply.

Prices of Live Stock Food When the farmer has to pay the following current prices it is not surprising that the cost of living is going up for standard live stock foods, with no likelihood of any material reduction possibly for years to come, if, indeed, ever. To make matters even more serious, the Canadian farmer is becoming more and more dependent on the American manufacturer for his stock foods. Cotton seed, our leading protein concentrate, is entirely of United States origin; linseed is largely controlled across the border, as also is packers' scrap, and even now bran and shorts are coming in, after the American manufacturer has taken all the "cream" off.

Some of the ruling prices of food used by the farmer in producing what we purchase from the butcher are as follows:—

Beef scrap, 60% protein, 12% fat.....	3½c. pound
Tankage, 60% protein, 12% fat.....	2½c. pound
Linseed cake meal.....	2¾c. pound
Cotton seed cake meal, 38% protein.....	2½c. pound
Bran.....	1¾c. pound

The Department of Agriculture says serious steps must be taken to get at the root of the high food cost. Two things stand out prominently as matters for enquiry, namely: Are we using every effort to discover other available sources of food, either directly or indirectly necessary to us, and further, are we making any effort to reduce the excessive cost of distribution, now amounting, we are told, to 65 cents in every dollar's worth of food we buy.

Little educational work will be necessary regarding this indirect food at this time; the demand is too serious. Cattle that should be kept as brood stock are being sold on account of the high cost and, indeed, scarcity of food. Much of this live stock is finding its way over the border, to Canada's detriment.

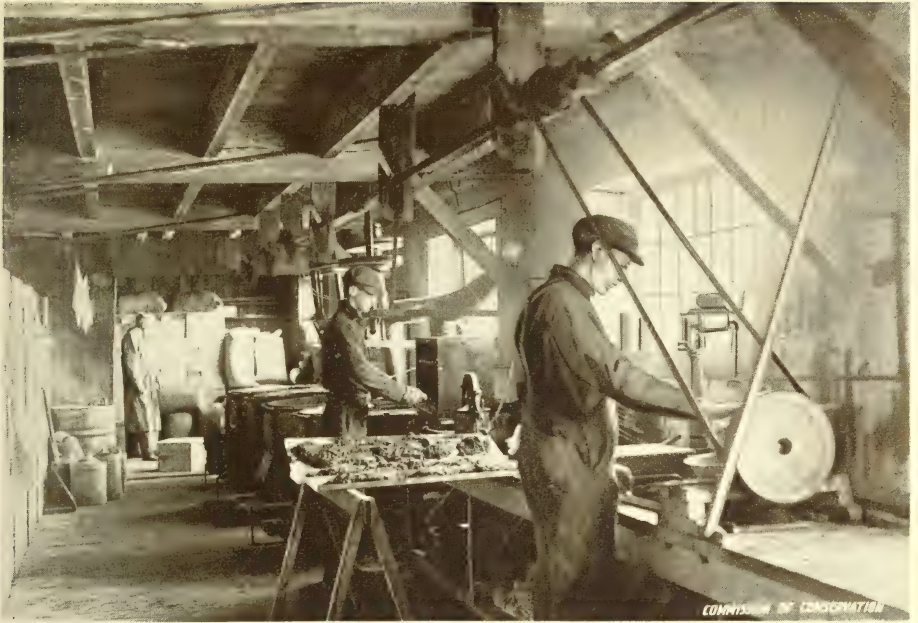
Fish Reduction Works Some work in this connection, it is true, is being carried out in Canada, but without any material influence on the agricultural community. On the Atlantic coast, three fish reduction plants are run by the Government for the purpose of mitigating the dog fish nuisance—these to benefit the fishermen, not necessarily the farmer. Our proposals, however, have an entirely different object in view. The product of these

factories is principally exported and thus lost to this country. There are also one or two private fish reducing plants on the Atlantic coast, one on the Great lakes, at Port Stanley, and two or three plants on the Pacific coast, all exporting their output to the United States.

The entire amount marketed, however, judging by the last report, was only a trifle over a thousand tons, out of approximately 236,000 tons of raw material available in Canada. Such material as is manufactured is only on a fertilizer basis and, therefore, does not come within the scope of this paper. This waste is most appalling, however, when it is realized that this material, if properly prepared, is worth to the farmer more in food value than even meat scrap and tankage, now selling freely at from \$60 to \$70 a ton.

Location of Reduction Plants	<p>From a manufacturing point of view, it must be admitted there are difficulties to be overcome. Particularly is this the case in the matter of location of collecting and reduction plants. Part of the process might be carried out on barges or lighters, which could be moved from place to place; this would overcome one of the main objections and it should be quite feasible. As much of the raw material is water, it would be too costly to carry, but the remainder is all valuable and saleable material and could stand a limited freight charge. The digesting and de-greasing might be handled at point of collection and the work completed in some central establishment on land during the winter months. This latter would consist of the compounding of live stock foods, the refining and preparation of oils for the various industries in the form they most desire them, the manufacture of fertilizers of various types suitable to various crops, the manufacture of glue, and the utilization of skins, particularly those of the dog fish and shark tribe. These latter are largely used in Europe in the manufacture of high class leather goods. The reduction work at present being carried out consists of extracting the oil only. This is disposed of in its raw state to the refiner, but, as the oil is not standardized, the best market price cannot be secured. The fish scrap is sold to the agricultural fertilizer manufacturer, at a price based on the available nitrogen.</p>
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The question arises as to who is to take the matter up—the Government or the private capitalist. The latter is not likely to enter the business owing to ignorance of market conditions, and to the fact that there are many elements connected with it beyond his control, such for example, as the objection of the fishermen to handing over their waste at a price that the manufacturer can fairly afford to pay. Nor can he count on the sympathy of the



UTILIZATION OF FISH WASTE, PORT DOVER, ONT.

The department where many mechanical processes of grinding and compounding were carried out.



UTILIZATION OF FISH WASTE, PORT DOVER, ONT.

The laboratory, where, after experiments, Mr. Feilding secured many valuable results.

agricultural industry towards a food supply to which it has not been accustomed. The private enterprise would thus be confronted by the two greatest problems of the manufacturer, namely, the control of his raw material and the distribution of his manufactured product.

Government Should Undertake Experimental Work	It, therefore, becomes the duty of this Commission, or some other governmental authority, to undertake this pioneer work and to show, first, the fishermen and canners, that it is to their advantage to dispose of this material at a nominal figure, or, preferably, on a profit-sharing basis; and, secondly, when manufactured, to demonstrate to the farmer, through experimental work, on the Government experimental farms, the value of this great food reserve lying dormant in Canada, only waiting to be extracted and made use of by the Canadian farmer and returned to Canadian soil. The farmer at this moment needs no great persuasion, for the demand is far too pressing.
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This question is closely bound up with the conservation of our national food supply, therefore, the matter should be taken up at once, since during the coming spring and summer, a serious food shortage for live stock will develop.

Associated very closely with the problem of indirect food supply—that of plant food—is the question of developing our vast sources of potash for fertilizing purposes. We have vast supplies of kelp on our Pacific coast, of the types *macrocystis* and *nereocystis*, practically inexhaustible under proper control. This would be invaluable in the manufacture of a “complete fertilizer” in conjunction with fish waste, and much the same drying plant could be used to prepare it. Dr. Cameron has done valuable research on the problem of potash reserve, which might be followed up with advantage in connection with the fish waste problem. Much pioneer work remains to be done, even in the practical application of research, which takes a long time. Laboratory results do not always materialize in practice as we consider they should. Research, however, is necessary, and when satisfactory results are attained, propaganda and dissemination of information based on the results should be put into effect without delay. This question is not a new one, except to Canada, but Canada has the advantage of information obtained in other countries on which to base her own investigations. These investigations should not be delayed in these pressing times; the food supply of our people and raw material for our own industries, not only now but after the war, are our paramount problems.

We must learn, as Japan has learned, that our aquatic products must not be wasted, but fully developed, that many industries are dependent on the aquatic by-products. We have yet to look into our kelp and our shells, as well as our enormous fish waste, and make use of all that is economically feasible.

DISCUSSION

SENATOR EDWARDS: Mr. Feilding has referred to the fact that Japan has taken a very prominent part in such investigations, as it does in almost every question that presents itself to that country. Japan is certainly a progressive country and this is one of the many things they have worked out. We have with us this afternoon the Consul General of Japan; perhaps we might have a few words from him.

MR. Y. NUMANO, Consul General of Japan: Mr. Chairman and gentlemen, I am sorry that I am not familiar with the subject of this very interesting report, to which we have listened this afternoon. I have taken measures to procure some literature and statistics bearing on the question from Japan, and may be able to present them to the Commission within a short time. Japan is well known for its fishing industry which has been greatly developed in all its branches. But I am not an expert on the question of fisheries, and I regret that I have not in my office any books or literature bearing on the question, nor have I had the time necessary to study it. I came to the meeting to listen to the interesting report to be made by Mr. Feilding, and I thank you very much for affording me the opportunity to do so.

Conservation of the Fur Resources of Northern Canada

BY

C. GORDON HEWITT, D.Sc.

Dominion Entomologist and Consulting Zoologist

IN considering how we may conserve to the best advantage, that is, how we may use in such a manner as to prevent destruction or depletion, the different natural resources of the country, it is necessary to take stock of the available resources of different sections of the country. In some regions agriculture is the most important resource, in others forests, water-powers or mines may constitute the natural wealth. But, while the wild life of all parts of Canada forms an important natural resource, in northern Canada it is practically the only natural resource. On its continued existence in an unimpaired condition depend not only the lives of thousands of the native inhabitants of the country but the future economic development of that immense area, which would otherwise be devoid of available natural resources. Thousands of square miles are unsuitable for agriculture, the forest resources are, on the whole, not sufficiently extensive or accessible to permit successful exploitation, and the development of the mineral resources is not only full of difficulties but is also dependent on the presence of a native food supply.

Northern
Fur-bearing
Animals

On previous occasions I have addressed the Commission on certain aspects of the conservation of the wild life of the north, but I wish now to deal briefly with other problems to which we should devote, and I am pleased to say we are devoting, our earnest attention. I have already dealt with the conservation of the great natural supply of meat and clothing in the north, namely, the barren ground caribou, and with the musk-ox. Another important constituent of the northern wild life resources—the fur-bearing animals—demands our careful consideration.

It is unnecessary to emphasize the wealth of fur-bearing animals in the north, where the more important of these animals find an environment so eminently suited to them and to the production of high grade furs. Our fur-bearing animals were the first of our natural resources to lure to our shores the intrepid souls who braved every kind of danger in their quest for furs. The fur trade of the

Northwest Territories is not only the chief occupation of that immense area but it is the only means of livelihood and existence of the population. Unless the fur trade is maintained an enormous part of the Dominion would be rendered unproductive, and the native inhabitants would either starve to death or become a charge on the Government. That, in brief, is the significance of this problem.

As pioneers in the exploitation of the valuable fur resources of that vast north country, the Hudson's Bay Co., through its well-known posts, has conducted its trade in a manner that would ensure a constant supply of furs. Their trappers were mainly Indians and, to a lesser extent, Eskimos. The Indian trapper is a true conservationist as a rule, inasmuch as he will not, in a region in which he is working, completely exhaust its fur-bearing animals. The Hudson's Bay Co. officers encouraged provident methods, since it was a business necessity, as indeed are all conservation policies. With the advent of the "free trader," however, conditions were changed, and especially so when the foreign trader-trapper entered the country.

**Foreign
Trappers and
Use of Poison**

The foreign trapper and free trader has no interest in the future of the country. His sole object is to get as much out of it as possible while he is able. His policy is accordingly improvident. In trapping, the chief desire of such a trapper is to "clean up" a piece of territory and move on to another place. The measures he employs are usually as drastic as his policy. One of the worst features of the methods of these men is the use of poison. Ostensibly it is taken into the country for the destruction of wolves, but the real purpose is generally of a wider character, and its extensive use results in a wide distribution of the poison. It is very necessary that the use of poison in the north country should be very greatly restricted and its importation more closely watched and regulated.

Information has recently come into our hands that we are to experience a greater invasion of trappers and fur-traders from the United States than heretofore. Previous knowledge of their methods in Canada and in the United States and Alaska cannot but make one fearful for the future of our fur trade of the north; unless we are willing to sacrifice the only available resource of that north country, and to allow the inhabitants to be deprived of their chief and, in many cases, their only means of livelihood, measures will have to be taken to prevent a dangerous extension of the destructive activities of these foreign trappers and traders, who have, as I have said, no interest in the future of the country; their sole

desire is to enrich themselves and the firms they represent in the quickest manner possible, and this would be at the expense of our northern resources.

Revision of Northwest Game Act At the present time the Northwest Game Act is undergoing a much needed revision, and we hope to be able to deal with this menace to the fur resources of the north. It is a question full of difficulties, but it is necessary that we overcome these if the Northwest Territories are to enjoy prosperity in the future. One thing is essential, namely, that some form of license system should be adopted. This would enable us to exercise a greater control over the operations of these trappers, whose activities affect the legitimate interests of the Indian trappers and other inhabitants and the operations of the older established Canadian companies, who are operating in a manner that will not jeopardize the future of our fur-bearing animals in the north.

It may be of interest to point out that the Danish Government administers the fur trade of Greenland as a government monopoly. State officers trade with the natives at so-called "buying-places." In this manner, and through their regulations regarding trapping, it is possible to exercise an amount of control that will ensure the conservation of the fur resources of Greenland to a far greater extent than is otherwise possible.

Greater control on the part of our government of the fur resources of the north is necessary, and I feel convinced, from the evidence we have of the destruction of fur-bearing animals in other regions, that unless such additional control is assumed, with the consequent exercise of greater precautions and foresight, the most valuable and available natural resources of that vast northern area will suffer irreparably.

With proper conservation, that is, utilization without excessive destruction or waste, the fur resources of the north would continue to provide means of livelihood for not only the present inhabitants, both white and native, but other Canadians too, and would furnish no inconsiderable portion of our national trade.

Natural Fluctuation in Fur Supply The output of furs fluctuates, but inquiry has shown that these fluctuations are natural and due to phenomena which many species of wild life exhibit; increase and decrease alternate in fairly regular periods of years, and are due to the constant adjustment that goes on in nature of what is frequently called "the balance of nature."

The periodical fluctuations, which are well known to inhabitants of the Northwest, of such herbivorous animals as mice and rabbits, are accompanied by corresponding fluctuations of their predatory enemies, the carnivorous fur-bearing animals, such as weasels, lynx, foxes, etc. This biological phenomenon, however, is not so simple as it seems, and the biological relationships of the fur-bearing animals to the smaller animals that constitute their food, and the causes governing the periodical increases and decreases of the latter, afford problems of the greatest scientific interest and practical importance. Nevertheless, though in some years the numbers of fur-bearing animals, under natural conditions, may reach a low level, they usually recover and the number caught gradually reaches another high level. If, however, all the fur-bearing animals in a region are systematically and thoroughly exterminated, there can be no recovery. Wild life is irreplaceable once it is destroyed.

There is undoubtedly in Canada a future for fur-farming, provided such operations can be prevented from becoming the object of absurd stock market speculation. But such domestic furs cannot replace the wild furs.

Forest Fires Destroy Ranges	The total area in which fur-bearing animals can exist in Canada is gradually being diminished in the development of the country. Some of this diminution is unavoidable, but so far as one notable factor in the destruction of the range of fur-bearing animals is concerned, namely, the destruction of our forests by fire, it cannot be claimed to be unavoidable. And it is necessary that we should remember this aspect of the forest fire question, namely, its relation to the abundance of fur-bearing animals. Large areas of the northwest have become unproductive of furs owing to extensive forest fires.
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But there are still large areas where the fur-bearing animals live their natural lives and where the surplus is removed by Indian and other local trappers. The supply of these animals will continue, provided they are properly conserved by preventing over-killing in any territory, and by the enforcement of the close seasons and the prohibition of any trade in unprime furs. We believe that this can be accomplished, and if this resource is wisely administered it will continue to render the far north a producing territory, and not the barren, unproductive region that many Canadians are accustomed to picture it, or into which the unrestricted destruction carried on by the foreign trapper would soon convert it.

Production and Preservation of Food Supplies

BY

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IT may be postulated that human living should be standardized in terms of human needs and rational aspirations, and that, through the aid of scientific knowledge, we are today enabled to supply means to this end. Essentially, man's needs demand protection both against outer dangers, as wild beasts and climate, and against any lack of food demanded by the physiological requirements of his existence as an animal. As, however, his housing may be either a great mansion or the peasant's simple cottage, so man's food supply may be either as prodigal as a Lucullus feast of gourmets in a New York hotel at \$25.00 a plate or a simple meal made up of the several elements of a food ration such as that in the recent tests made in physiological feeding of volunteers from the police force of that city.

FOOD VALUE AND RELATIVE PRICES

While it would be absurd to propose, having obtained information regarding the number of calories, or heat units, of energy contained in the different kinds of food, together with the cost of such foods, that there should be laws passed requiring that each person should live strictly within the limits of such food requirements, yet an analysis of any table of food values, such as the following, from the standpoint of nutrition and the prices of the different foods therein, makes it plain that there is today really no relation between the two.

TABLE I.—PROTEIN, FAT, CARBOHYDRATES AND FUEL VALUE OF ONE DOLLAR'S WORTH OF EACH FOOD

	Price	Protein lbs.	Fat lbs.	Carbo- hydrates lbs.	Fuel Value Calories	Com- parative values
Rolled oats.....	\$0.05 per lb.	2.5	1.36	14.3	36,950	100.
Fall wheat flour.....	4.75 " cwt	2.	.20	16.0	34,307	92.8
Spring wheat flour.....	5.00 " "	3.	.20	14.3	33,780	91.4
Corn meal.....	.05 " lb.	1.31	.25	16.26	33,735	91.3
Farinas.....	.05 " "	1.9	.20	15.6	33,394	90.4
Rolled oats (package)...	.25 for 4 lbs.	2.	1.09	11.5	29,560	80.
Sugar.....	8.00 per cwt..	.....	.....	12.5	23,250	62.9

TABLE NO. 1—*Continued*

	Price	Protein lbs.	Fat lbs.	Carbo- hydrates lbs.	Fuel value Calories	Com- parative values
Rice.....	.07 per lb.	1.06	.05	11.3	23,210	62.8
Peas.....	.07 " "	3.	.19	9.0	23,121	62.6
Farinas (package).....	15 for 2 lbs.	1.26	.14	10.3	22,207	60.1
White bread.....	16 for 3 lbs.	1.58	.38	9.1	21,650	58.6
Buttermilk.....	.10 per gal.	3.	.50	4.8	17,362	47.
Skim milk.....	.10 " "	3.4	.30	5.1	17,070	46.2
Barley, pearl.....	.10 " lb.	.84	.10	7.8	16,492	44.6
Beans.....	.10 " "	1.95	.27	6.0	15,500	42.
Potatoes.....	2.25 " bag.	.87	.04	6.24	13,397	36.2
Malta Vita.....	.10 " 12 oz.	.74	.10	5.87	12,716	34.4
Toasted corn flakes.....	.10 " 12 "	.42	.11	6.06	12,517	34.
Grape Nuts.....	.15 " 17 "	.81	.07	5.56	12,143	33.
Milk.....	.08 " qt.	1.04	1.27	1.66	10,402	28.2
Shredded Wheat.....	.13 " 12 oz.	.66	.05	4.42	9,659	26.1
Beef, flank.....	.14 " lb.	1.21	1.36	.....	7,970	21.6
Butter.....	.45 " "	.....	1.88	.....	7,933	21.5
Cheese.....	.30 " "	.93	1.22	1.4	7,138	19.3
Mutton chops.....	.24 " "	.56	1.20	.....	6,106	16.5
Ham, smoked.....	.28 " "	.51	1.19	.....	5,963	16.1
Beef, sirloin.....	.25 " "	.66	.65	.....	4,000	10.8
" round steak.....	.24 " "	.79	.53	.....	3,718	10.6
Lamb, hind quarter.....	.27 " "	.61	.60	.....	3,672	10.
Ham, smoked and cooked	.45 " "	.44	.50	.....	2,930	8.
Salmon, canned.....	.25 " "	.78	.30	.....	2,717	7.3
Salmon trout (fresh)...	.15 " "	.61	.34	.....	2,569	7.
Cod (salted).....	.18 " "	1.05	.02	.....	2,307	6.2
Eggs.....	.48 " doz.	.37	.29	.....	1,912	5.2
Halibut (fresh).....	.25 " lb.	.61	.18	.....	1,894	5.1

The above table, taken from *Bulletin 245*, Department of Agriculture, Ontario, prepared by R. Harcourt, professor of chemistry, Ontario Agricultural College, Guelph, shows clearly the relations between the nutritive values of different foods and the cost of same. He states:—

"A study of the accompanying table shows that the foods derived from the cereal grains stand at the top of the list. This is not surprising, as they contain a large amount of carbohydrates, which are the cheapest fuel material among our foods. But it is worthy of note that they also furnish comparatively large quantities of protein and fat, much more than can be purchased for the same money in the form of meat, fish or eggs. Thus one dollar's worth of oatmeal at prevailing prices will contain two and a half pounds of protein. The same amount of money expended on a good spring wheat flour will furnish three pounds of protein; bread, a little over one and a half pounds; milk, over one pound; while sirloin steak will only supply two-thirds of a pound and eggs about one-third of a pound. Consequently the cereal foods not only stand first on the list in fuel value, but they also are capable of furnishing more protein for a given amount of money expended than can be procured in meat, fish or eggs. It is true that the protein of these latter

foods is more easily and completely digested, but the foods from the cereal grains contain so much more of it that this could not possibly make up the difference, and, furthermore, these cereal foods contain an abundance of the cheap heat-producing carbohydrates to do the work of digestion. Among the foods placed on the table, buttermilk and skimmed milk are our cheapest source of protein, and they are probably as fully and as easily digested as the protein of meats."

Cereals the
Cheapest Food

After pointing out that the cereals, as wheat, flour, cornmeal and oatmeal are much the cheapest foods and that whole flour or graham flour yields

all the elements of nutrition, he quotes an authority for stating that the average man doing light work can get along very well on 120 grammes of protein, 50 of fat, and 500 of carbohydrates (starches) per diem, and gives the illustration of how 1.5 lbs. of rolled oats, 1 pint of whole milk, 2 pints of skim milk and 2 ounces of sugar do this at present prices for 12.5 cents per day. It will be noted, however, that the list contains no vegetables or fruits; while the need for such as a health requirement in winter climates, where so much animal food is used, has long been recognized, and condiments, as spices, which stimulate digestion, must not wholly be eliminated from the category of necessary foods. In a series of most valuable paragraphs in the same bulletin, by Miss M. U. Watson, director of home economics, reference is made to the wisdom of cultivating home-grown fruits and vegetables and also how to use milk, meat and fat economically.

FASHION IN FOODS

Advertising
Sells Foreign
Fruits

From the illustrations given it is abundantly plain that the question of the food supplies of the people must be judged from the many standpoints, which

cannot be wholly determined by the question of nutritive values and prices. For instance, in 1914, it was estimated that the apple crop of Canada was approximately 20,000,000 bushels, yet the total amount exported was only 876,643 barrels and probably dried apples represented 100,000 barrels additional, leaving the remainder either to be consumed in Canada or to decay uncollected in the orchards. In spite of this fact, 350,907 barrels, worth \$1,104,302.00, were imported during the same year, as also \$11,018,505.00 of other fruits. Thus the element of fashion in tastes for food is developed quite readily both from an appeal to

the palate and to social exigencies, these being further stimulated by clever business advertising. For instance, fifty years ago an orange to a Canadian boy was as precious as a silver coin, while it is but forty years since the banana appeared in the Canadian market. Twenty years ago California Christmas grapes were almost unknown in the east, while western American apples have been forced upon the Canadian market increasingly in recent years.

Preparation of Crude Food Products The question of a national food production thus presents many aspects, not the least being the æsthetic factor and, equally, the application of scientific methods to the preparation of the crude products for general consumption. This may be illustrated by the fact that, up till forty years ago, the wheat supplied for consumption in Canada was a mixture of local spring and fall wheat, ground by stones in the local mill, the flour of which retained all the essential qualities of grain as food; but, with the introduction of the roller process and other machinery, our grain foods are supplied to the market in a dozen forms, as are illustrated in the previous table, and at prices wholly out of accord with their food values.

Federal Food Bureau Required It is apparent from such examples that, in the interests of the people who have no knowledge of the nutritive values of food, a federal food bureau is required. The bureau would devote its time to the analysis, not only of the various natural foods in relation to their nutritive values, but also to educating the public, through popular literature, both as to the best methods of preparing our common foods, such as cereals, and as to what prepared foods offered for sale have a nutritive value closely in relation to their price. In nothing, for instance, could such a bureau do better than in educating the people with regard to the many forms in which candies and other confections are offered for sale.

Butter Fat Diverted to Ice Cream The extent to which such foods are used by the people of Canada is difficult to arrive at exactly, but the following illustrations, taken from government reports relating to ice cream, are of interest. A publication just issued, containing the findings in a hearing by the Department of Agriculture at Washington on ice cream standards, illustrates the amount of cream diverted from whole milk in that country annually, stating that:

“If the average butter fat of 6 per cent to 8 per cent of the several hundred million gallons of ice cream produced and sold in 1916 were raised to 14 per cent (practically the standard adopted for

Canada) about 75,000,000 pounds of butter fat would be diverted from the butter market and injected into ice cream, with a corresponding increase to consumers of butter, and to the consumers of ice cream, who do not want additional calories (heat units) in a confection designed primarily to lessen the internal temperature of the consumer on a hot day."

As further illustrating this important matter, the *Report of the Dairy Commissioner* of the Department of Agriculture of Canada for 1913 may be quoted:

"Some figures relating to the ice cream trade were collected during the year. Returns were obtained from 60 ice cream manufacturers in 24 towns and cities. Of this number, all but 13 have been established since 1904, and they all report that their business is growing at the rate of 20 per cent to 25 per cent per year. The quantity of cream used for ice cream by the manufacturers from whom returns were received is equivalent to about 2,000,000 pounds of butter, and of course this does not take into account the large quantity used by the hundreds of smaller ice cream makers all over the country."

**What Foods
to Produce**

From what has been shown in the above figures, it is quite evident that the primary problem of *what to produce* of the various kinds of foods plays

an extremely important part in the relation of government advice and control in the matter of standardizing both the quantity and quality of the food supplies of the country. It is apparent that this problem should be quite as much a part of scientific supervision as is the education of producers as to what products will grow best in different climates and soils, as well as informing them with regard to the markets in different countries for certain products and the regulating of production in keeping with the demand. It is further evident that, until the present war, the general supply of different foods on the American continent had been usually so abundant and the ability of so many persons to buy what their fancy dictated had been so general that practically no scientific enquiries, beyond the mere academic ones of the chemist's laboratories, had been set in force to investigate such problems and arrive at scientific conclusions regarding them. But, today, with the ever-soaring prices of common foods, it is apparent that the expert scientific and business knowledge which can be brought to bear upon this problem would do more than anything else to assist the common people in establishing and maintaining what may be called a proper standard of living.

**Efficiency of
the Individual**

The problem of the efficiency of the individual is so intimately associated with national efficiency that no labour can be too great to attempt to determine

on what basis such efficiency rests and to bring to bear whatever

forces are possible to secure it. This will be made evident when it is realized that the relation between the individual as a producer and consumer of his own food is an altogether different problem from what it was even fifty years ago. The following table showing distribution of population will illustrate this:

TABLE II.—DISTRIBUTION OF POPULATION

Population of United States			Population of Canada			
Year	Total	Urban	Year	Total	Urban	Per cent
1820	9,638,453	475,135	1832	772,980	Upper	
1840	17,069,453	1,453,994	1841	.....	and	
1870	38,558,371	9,071,875	1851	1,741,263	Lower	
1880	50,155,783	14,772,438	1861	2,507,657	Canada	
1900	75,994,575	30,797,185	1871	3,641,257	684,823	18.7
1910	91,972,206	42,623,383	1881	4,268,364	909,522	21.3
			1891	4,801,071	1,537,098	32.1
			1901	5,251,186	2,021,199	37.7
			1911	7,188,162	3,280,444	45.6

Such are the census figures for the total and urban populations in cities and towns in the United States and Canada of over 5,000; but it is apparent that the population engaged in agriculture is by no means the difference between these two. The United States Department of Agriculture, in its *Annual Report* of 1914, gives the following percentage of population engaged in agriculture in different years: 1820, 87 per cent; 1880, 44 per cent; 1890, 39 per cent; 1900, 35 per cent; 1910, 32.4 per cent.

The urbanization of England's population during a century and a half of industrialism is historic; but the following figures from Dawson's *Industrial Germany* show that the urbanization in that country has proceeded more rapidly during the period given in the table than even in the United States. Thus:—

Year	Total urban population		Rural communes	
1871	14,790,798	36.1 per cent	26,219,352	63.9 per cent
1900	30,633,075	54.3 " "	25,734,103	45.7 " "
1910	38,971,406	60.0 " "	25,954,587	40.0 " "

The increase in the large cities of Germany, that is, of the cities with 100,000 population or over, during the period is quite remarkable. In 1871, there were only 8 cities of 100,000 or over in all

Germany, but, in 1910, there were 48. In 1871, these cities held only 1,968,537 inhabitants, or 4.8 per cent of the whole population, whereas, in 1910, they held 13,823,348, or 23.3 per cent of the whole. In 1882, 48.5 per cent of the whole population actually depended upon agriculture, but, in 1910, this proportion was only 28.6 per cent. In 1882, only 35.5 per cent depended upon mining and manufacturing, while, in 1910, 48.8 per cent depended upon the same. In the needs of an over-developed industrialism many have seen the genesis of the war.

Movement of Population

As these several figures abundantly illustrate, for over half a century, a regular movement of population in the United States, Germany and Canada has gone on directly from country to city in an ever increasing momentum. Thus, during the census period, the population of the towns of over 5,000 inhabitants in the United States increased from 30,797,185 to 42,623,383 in 1910, while those of Canada grew from 2,021,799 to 3,280,444, and of Germany from 20,633,075 to 31,971,406.

INCREASED PRICES OF FOODS

As regards the production and price of foods, these figures make it abundantly plain that either the ability to produce on the part of the agriculturist must have increased during this period in these several countries in proportion to the relative urban increase, or that the supply of food must have become relatively less, and by so much the price will have either increased or the lack of products in any one country will have been supplied from other countries producing an excess of food aided by cheap transportation. That such increased production has not taken place, however, in Canada, is shown in the following remarks with regard to increase of production of various food products and the relative price of foods from the *Report of the Department of Labour for 1910*:

"For some time past, and especially since the beginning of the present century, one of the most important features of the general economic situation in Canada has been a rapid and continuous advance in prices and the cost of living. The upward tendency seemed to have reached its highest point in 1907, when prices attained a level unprecedented in many years previously. The financial panic of the autumn of that year operated in arresting this tendency, and, in many departments, set in motion a recession which extended over 1908. The check, however, proved but temporary. The comparative slowness of its effect and the early recovery of the upward trend constituted, in fact, an especially noteworthy feature of the stringency in Canada. This became marked with the increasing industrial activity and trade prosperity of 1909, in the closing

months of which the high cost of living had become a subject of widespread discussion, affecting as it did the immediate personal well-being of nearly every one in the community, especially those of the wage-earning and other classes dependent on fixed incomes. Since the opening of the present year, public interest has been still more intense, a large number of the trade journals and daily newspapers of the country having published articles dealing with the question in greater or less detail, while a number of investigations of varying character into the nature and causes of the rise have been made by public and private initiative. At the present time it is safe to say no economic question equals in public interest that of the recent rise and the existing level of prices."

The following table, from Vol. II of the *Report of the Board of Enquiry on the Cost of Living*, issued in 1915, still further accentuates the increase in cost:

TREND OF WHOLESALE PRICES IN CANADA AND THE UNITED STATES, 1900-1913

CANADA						
1900	1901	1902	1903	1904	1905	1906
100.0	100.8	101.9	102.8	103.6	107.8	110.8
1907	1908	1909	1910	1911	1912	1913
116.2	112.7	113.6	117.5	120.0	128.0	127.7

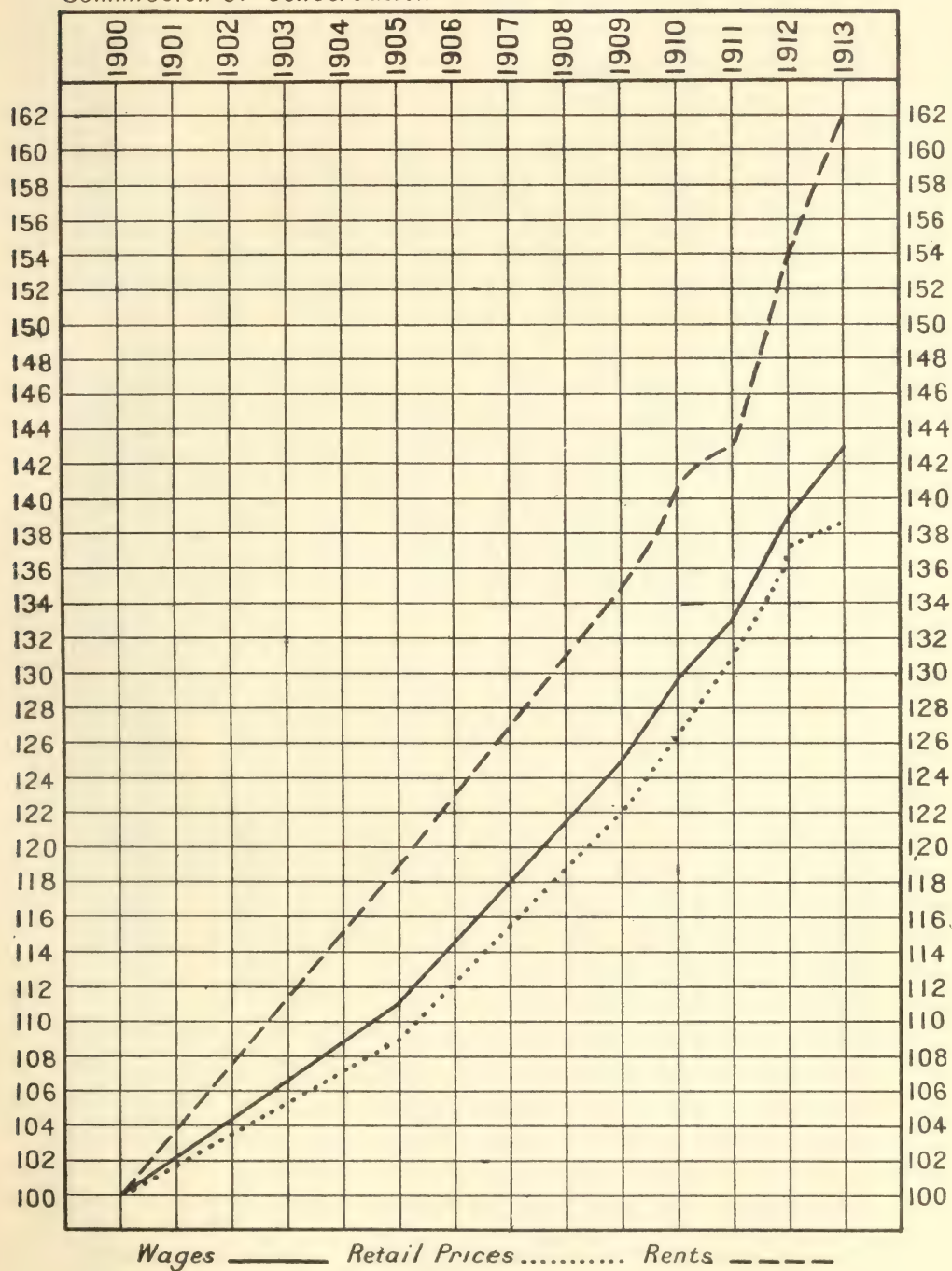
UNITED STATES						
1900	1901	1902	1903	1904	1905	1906
100.0	99.1	103.9	103.3	102.8	104.5	110.8
1907	1908	1909	1910	1911	1912	1913
117.6	110.0	113.2	118.0	118.4	122.6	119.6

Note: 100 is adopted as unit or standard price.

Increase of
Wages

Reverting to the question of standardization of living, it must be apparent, as a general deduction, that either the millions added to the city population in both the United States and Canada during the fifteen-year period 1900-1915 have, through their ability to earn increased wages, been enabled to pay for the increased price of food or that the standard of living must be inevitably decreased. That such wages have not increased in proportion and that the point of mere human subsistence has been approximated for millions of individuals in these cities is shown by the following diagram of wages, rent, price of food, etc.

Commission of Conservation



Abstracts from the *Labour Gazette* in the *Report of Cost of Living* give the following re wages:

(a) 1902. The upward movement was noted as an important feature.

(b) 1907. Wages continued to rise throughout the first half of 1907, which was a period of great activity for all classes of labour. The increase affected fully 100,000 men, of whom transportation contributed a large proportion, with lumbering and mining employees coming next in order. A sharp recession in the autumn, however, which reflected the financial crisis, and the short crop about wiped out on them the advance made during the earlier portion of the year.

(c) 1910-13. During 1910 the upward tendency increased, a condition which became accentuated in 1911 and 1912, and reached its culmination in the early summer of 1913, marking a third period of great general prosperity and advancement, in which all classes of labour, but particularly the publishing, building, transportation, and unskilled classes, showed very largely. The cessation of the advance in the latter part of 1913, resulting from the check to trade, administered by the increasing tightness of money, affected the final results for the year to an appreciable extent, the situation being in some degree parallel to that of 1907, though the reaction was less sudden.

TABLE III.—SHOWING SOME OF THE RATES OF WAGE INCREASES
(1900, being taken as standard = 100)

	1900	1905	1907	1910	1913
Agriculture.....	100	111.5	118.2	133.3	150.7
Lumbering.....	100	105.3	111.5	122.5	129.3
Mining.....	100	109	117.2	121	123.5
Building.....	100	117.5	125.7	136.8	150
Printing.....	100	113	121.7	134	152.4
Clothing.....	100	114.6	127.7	136.2	151.4
Municipal employees ...	100	110.4	115	125.6	141.4
Domestic service.....	100	111.6	127.3	129.7	142.9

The above table is instructive, not only because of the increase by over 50% of agricultural wages, but also because this is accompanied by decreased hours of labour. The problem of *real wages*, or of earnings over the cost of living, is of a complex character, but is illuminated by the preceding diagram and table.

It has seemed essential to the proper solution of our problem to indicate some of the influences which directly affect it. The statements and tables given show the rapid increase in the products of Canadian manufacturers in the period 1900-1910; and, in a country with poten-

Rapid Increase
in Manufactures

tialities of untold agricultural wealth, it might naturally be assumed that a similar progress would have been shown in its development. The following tables show, however, that a very different result has followed during the whole fifteen years past, except in the increased amount of cereals grown in the Prairie Provinces. Thus, in the census figures for Ontario, oats were the only crop of any importance that did not show a decrease in 1910.

PRINCIPAL FARM PRODUCTS OF ONTARIO IN CENSUS YEARS

	Wheat	Barley	Oats	Corn	Peas
1910	19,842,631	14,055,327	88,946,041	13,742,265	4,311,133
1900	28,418,907	16,087,862	88,138,974	24,463,694	11,351,646
Decrease	8,576,276	2,032,545	.....	10,721,429	7,040,513
Increase	.....	.....	807,067	.....	.....

	Horses	Milch cows	Other cattle	Sheep	Swine
1910	811,585	1,032,979	1,471,694	747,483	1,864,165
1900	721,138	1,065,763	1,422,043	1,046,456	1,562,695
Decrease	.....	32,784	.....	302,973	.....
Increase	90,447	.....	49,651	.....	301,469

Agricultural
Production
Stationary

Thus in the ten principal items Ontario's products show a notable decrease, only six showing even a nominal increase. What is significant is that such production seems associated with an increase in the land under crop by 478,638 acres over the 9,212,478 acres in 1901, but the lessened production is in keeping with the decline of rural population by 52,184 during the census period. In a broader way the stationary condition of production is shown in the tables on pages 150-153 showing the estimated products since 1910, where all the items, except horses and perhaps swine in 1914, show a decline in the total production. In view of the fact that the census of 1911 showed an absolute loss of population in Ontario of 52,194, which illustrates the situation in the other old provinces, and an estimated loss of the natural rural birth increase of 150,000, also of 120,000 immigrants, or 30% of 400,000, who came to Ontario in the period, this lessened production is not surprising. This is understood when such splendid counties as Huron, Bruce and Grey, populated almost wholly between 1840 and 1860 with settlers directly from Great Britain, showed decreases in the census decade of 17, 18 and 20 per cent, respectively, in addition to the loss of their natural increase.

Similarly, as shown in the *Pictou Social Survey* in Nova Scotia, the census showed a very marked trend of population to the urban centres; the rural population showing a decrease of 1,177, or 15.9 per cent, 411, or 13 per cent, being in Colchester and 766, or 17.4 per cent, being in Pictou, and the urban population an increase of 4,932, or 42.7 per cent. This report also states:—

“The problems of the districts under consideration are neither those of an immigrant nor a tenant population, as in many parts of western Canada. With two exceptions all those interviewed were born in Nova Scotia, and a very large proportion of these in the counties in which they now reside. All the farmers interviewed were farm owners. Only four stated that in addition to their own land they rented areas ranging from 20 to 240 acres.”

Movement of Population Having made the situation plain it will be proper to investigate the underlying causes of the loss of population. Back of it all lies the movement of population made possible the world over through the invention of steam, and its use in transportation. Old Canada was well settled by 1860, her natural increase was 1.5 per cent per annum, and the lands occupied were utilized almost wholly for grain growing. The old east surplus populations, both in the United States and Canada, had begun the trek westward before the railroads; with them the movement was enormously intensified. Up to 1850 some 75 per cent of the total value of United States farm lands lay east and south of the Ohio valley, but by 1900, 51 per cent of the total agricultural products were from the twelve north central states, where the farms taken up between 1870 and 1900 increased from 1,125,078 to 2,196,567, just as in the Canadian Northwest the homestead entries increased from 2,384 in 1897 to 33,699 in 1912. The direct effect of the enormous increase, both by migration and by immigration to the American west, was the cheap production of enormous quantities of wheat and of cattle on the ranches, which so depressed the price of grain and cattle that the farms of the East, lessened already in their fertility, had to compete with wheat at 50 cents a bushel and cattle at 3 cents per lb., live weight. A part of the movement westward was owing directly to the employment given to many thousands of immigrants in building the railways, who were attracted by the cash payments for work, which gave them at once a good living wage instead of waiting for returns from the land. With this phenomenal movement of population, there grew up many urban centres along the trade routes; but, in addition to these, land speculators created thousands of boom towns, which reverted to their normal village condition so soon as the railway was completed. What the American west earlier

experienced Canada repeated from 1902-13, and the rural conditions which have been so fully indicated followed, or were but a continuation of, what had gone on in the forty preceding years in Canada owing to contiguity with the United States.

Analyzed, it is apparent that the causes for this rural depopulation were primarily *economic*. If it be said that the farmers of the older provinces and states should have adopted more scientific methods and varied the kinds of crops grown, it can be answered that, owing to the customary mode of settlement on the large farms, grain-growing was the logical practice, as it implied a simple procedure and a product which did not depreciate and was a common medium of exchange of recognized value.

ECONOMIC CAUSES OF FALLING OFF IN PRODUCTION

We have seen the outcome of the fifty years' movement of population in Canada, and may fairly assume that, with the last great west now more or less occupied, our attention will naturally revert to studying the factors in the reconstruction of the older settled provinces. The losses to the East in *man-power* have been enormous. Over 1,000,000 have been lost by Ontario to the United States alone since 1870, and the estimated movement from country to city in Canada for this same period is estimated at 1,600,000. The cost of rearing even such a population at \$2,000 per person is \$3,200,000,000, which the country may be said to have presented to the city. The process of further abstracting capital goes on to-day, not only in *man-power* but also in money capital, since the various chartered banks are systematically transferring their rural deposits to city commercial centres to be used in large enterprises, scarcely one of which has to do with the development of agriculture and the increase of production. The process is, moreover, injurious, to the extent that it tends to a high rate of interest and to short loans to farmers for permanent improvements.

Depleted Rural Homes

This loss of boys from the farm means not only the loss of their labour but, further, the removal of their share of any inherited patrimony from the country to the city; while the artisans, once located in small hamlets, have gone to larger centres, village business lessens with the growth of the mail order system. As a careful rural observer states:

"My home township of Edwardsburg lost 14 per cent of its farm homes in the decade 1909-1910, and this is neither exceptional nor extreme. But the abandoned dwelling is a lesser evil than the depleted household. In 1901 the average number of persons to the household throughout Canada was 5.16. In my home county of Grenville,

typical of rural life, it was then 4.42. By 1911, the average for Canada had fallen to 4.84. But in Grenville it had fallen to 4.07. Nor is this exceptional nor extreme. Middlesex North had but 3.8, Prince Edward 3.8, Norfolk 3.7. Yet Toronto has 5 to the household, Halifax and Winnipeg 5.3, Montreal 5.4. The low average for the country is not race suicide—it is class suicide. There are not, to any serious extent, childless homes; they are homes whose children have gone. Were the children born in any community 15 per cent less in number than the parents—for that is what 3.7 is equivalent to—that community would be doomed. But is it well where, in a community of over 20,000 persons, such as normal Norfolk, the children remaining in the community are 15 per cent less than the parents? Is not the class doomed?

As this student of the situation so acutely remarks:*

"The school suffers. In my home township there is a school with but a single pupil on the roll. Last year the school was not opened, the trustees paying \$300 to have the solitary pupil conveyed daily to the next district school and taught there. Yet fifty years ago that school had an attendance of 45.

Social life suffers. This loss is from the beginning of life and throughout its course and in all its elements."

As bearing upon the economic problem, the following, relating to the earnings of manufacturing establishments, is of extreme importance:†

Year	Capital value of plants	Number of employees	Wages	Value of raw and partly manufactured articles	Value of products
1900	\$ 446,916,487	339,173	\$113,249,350	\$266,527,858	\$ 481,053,375
1905	846,585,023	392,530	165,100,011	.....	718,352,603
1910	1,247,583,609	515,203	241,008,418	601,509,018	1,165,975,730

"According to the above table the average earnings in manufacturing establishments advanced from \$333 in 1900 to \$420 in 1905 and to \$467 in 1910, a rise in the decade of 40 per cent. Proportionately, however, to the value of the finished product the wages bill had been decreasing. In 1900, it was 23.5 per cent, in 1905, 22.9 per cent, and, in 1910, only 20.6 per cent. The similar ratio of raw materials to the finished product also has declined from 55.4 per cent in 1900, to 51.6 per cent in 1910."†

It is further pointed out that the profits in proportion to the amount of capital invested and cost of production steadily increased,

* "The Rural Problem," by Rev. John MacDougall, B.A. *Report of Social Service Congress*, Ottawa, 1914.

† From the *Report on Cost of Living*.

in spite of the cost of labour from 21.1 per cent in 1900, to 27.4 per cent in 1910. This may be roughly illustrated by the following table abstracted from the *Canada Year Book*, 1914:

COMPARATIVE TABLE OF VALUES IN THREE
LEADING INDUSTRIES

	Agriculture	Manufactures	Railways
Total value of farm property and of capital in manufactures and railways....	\$4,231,840,636	\$446,916,487	\$1,808,829,761
Total values of farm products, gross earnings of manufactures and of railways.....	(Cereals, etc.) 638,580,300 (Stock) 525,530,191	1,165,975,639	243,083,539
Profits after deducting operating costs	286,586,916	323,458,205	65,108,280
Profits.....	6.7 per cent	27 per cent	35 per cent
Total employees.....	1,000,000	515,203	159,142
Average salaries.....	286.00	241,008,416 437.00	111,762,972 702.00

Small Returns from Agriculture Probably the actual situation has nowhere been better illustrated than the following statement, made in February, 1917, by M. Cummings, B.A., B.S.A., Principal, Nova Scotia College of Agriculture:

"I interviewed six farmers, selected out of an audience of one hundred, with a view of getting information, first, as to the usual annual returns from their farms, and, second, as to whether they are making more money this year than last year. These men were speaking not only for themselves, but for the communities with which they were familiar. First, I asked them what they thought was the net labour income of the average farmer in their community. This was defined as the balance of receipts for a year, after running expenses of the farm and interest on their investment had been paid. To make this point a little clearer, I may say that the farmer would have a certain amount of his living from the farm, such as his potatoes, milk and a certain percentage of his beef, etc. Nevertheless with his net labour income he has to buy his other household commodities, such as tea, sugar, flour, etc., clothes, and also pay for incidental doctor bills, charities and farm improvements.

"Averaging the statements received from all of these men, the figures indicated that the average net labour income of the average farmer in the communities represented was rather less than \$300 per year. However, as the average farmer has never paid for the investment in his land, he usually has the interest on this investment to the good. In the case of the ordinary 100 to 150 acre farm in Nova Scotia this would mean from \$150 to \$200 per year.

"One of the farmers interviewed, who keeps books very carefully said that he himself, as a large strawberry and fruit grower, had a net income from the past year of over \$1,000, but he knew of neighbouring farmers whose net labour income was not more than the interest on the value of the property—in other words, nil."

This is supplemented by a statement supplied by a prominent dairyman of the district through the kindness of Dr. J. B. Hollingsworth, V.S., Inspector of Food, Ottawa:

Value of farm property (140 acres)	}	\$15,000.00
" 30 head milch cows		
" 6 horses		
" farm machinery and buildings		
Int. on \$15,000 at 4 per cent.		\$600.00
Feed purchased for year		790.00
Taxes and insurance		100.00
Expenses of house (\$100 per month)		1,200.00
Wages to 1 man (\$30.00 per month)		360.00
Blacksmithing and general repairs		100.00
Toll		15.00
Saturday expenses in city (delivering milk)		50.00
		<hr/>
		\$3,215.00
Cash receipts from sale of milk		3,400.00
" " " " " calves		100.00
		<hr/>
		3,500.00
		<hr/>
		3,215.00
		<hr/>
Wages for myself, wife and 3 children (for year 1916)		285.00

Note:—No estimate is made for rent or depreciation of premises.

AIDS TO INCREASED PRODUCTION

It is estimated that there are 935,000,000 acres of arable lands in the United States, but that only 400,000,000 are in farms and improved, the balance being unimproved; further, that but 40 per cent of the land is reasonably well cultivated, and less than 12 per cent is yielding fairly full returns. In Canada, the proportion of unimproved land is very much greater, while there is no evidence to show that any more effective cultivation exists here than there. To the end of improved cultivation increased labour is essential. Especially is this true in war time; but the table of wages already given shows that agricultural labour had already risen in 1913 by over 50 per cent of what it was in 1900, and is yet higher to-day. It is evident that, apart from home-grown labour resident on the

farm, its price will be regulated by the price in the neighbouring city for a nine-hour wage. So extreme is the situation in fact that, according to the *Pictou Survey*, eighty-two per cent of the farmers considered it difficult to get suitable hired help. During the last decade, the cost of farm labour has increased 38 per cent. This increase many farmers consider has rendered farm help prohibitive. Less than 3 per cent of the farmers employ female help.

**Ontario Farmers
Leave Farms**

The indirect effects of this lack of labour are seen in some of the oldest and most highly cultivated areas of Ontario, within from thirty to eighty miles of Toronto. The writer knows of many instances where farmers, within six to ten miles of lake Ontario, have rented their farms at nominal prices to neighbours for pasturage, and have gone to the villages along the front or to the cities, giving as the reason that, with lack of capital, the distances from town markets, and the high price of labour, owners could not continue operating their farms profitably. In vain had they offered their farms for sale at low values; now they seem content to live in a small way, cultivating a garden and working at casual work in the village or on adjacent farms, demanding the wages fixed by town usage and by the hours of organized labour.

But, if rural labour has so decreased, it might be assumed that the lack would be made up through the increased use of machinery. While in this direction may be found a partial solution, in practice it is found that the cost of sufficient machinery, with its period of use limited to the harvest time, is often too great for the returns secured from it, unless there is adequate farm help. This difficulty is, nevertheless, being here and there met by neighbours combining their working force. To these difficulties are added the facts of insufficient capital to make cash purchases and the difficulty of obtaining loans at low rates. Such rates in progressive agricultural countries in Europe range from 3 per cent to 4 per cent on long terms.* The use of cheap money is likewise needed for purchasing at best prices good seed and fertilizers. Of course, to these difficulties are too often added the even greater one of a lack of business and scientific knowledge on the part of the farmer as to the economic value of the permanent employment of farm labour and of

* That serious efforts are being made in Canada to cope with the problem of limited capital is seen in the passing of

(a) The Farmers Credit Act, Saskatchewan, 1914 and 1917.

(b) An Act making Provision for Agricultural Credits, British Columbia (1915)

(c) An Act for creating Farm Settlements and Advancing Loans, New Brunswick (1916). Also various schemes in other provinces for assisting settlers on the land by loans.

buying fertilizers. If uncertain as to results, he will err on the side of safety and not invest his money in these things.

Advantages of
Co-operation

But if, as has been shown, the farmer as an individual labours at a great disadvantage, there is the possibility of his co-operating with his fellows of the community. Thus, they may, as has been worked out in most European countries, concern themselves with obtaining adequate and cheap money for development, for purchasing seeds, fertilizers, etc., in car lots at best rates, with the co-operative use of help and machinery, with the co-operative collecting, conserving and preparing products for markets, and with selling in wholesale quantities and directly to large distributing houses or even to individuals. What this development may become in less than twenty years has been seen in Denmark, a country of less population than Ontario, which, in 1906, had 1,076 co-operative societies, with 157,537 members, who did \$450,000,000 worth of business. Sir Horace Plunkett, who has done so much to assist Irish agriculture, summed up the problem in "Better farming, better business and better living." As has been so well pointed out in the *Saskatchewan Report of the Agricultural Credits Commission* (1913):

"Whether or not the farmer has become a good business man, agriculture has become a business and business requires capital. This may be in either of two forms, money or credit. Whatever be its form, the farmer who will succeed to-day must have constant access to capital. The farm is ill-suited to provide a constant supply of ready money. Crops are harvested but once each year . . . He should not be compelled to repay at a time when it is not profitable to dispose of his produce or stock. It is most important to note that the turnover of capital in one crop a year on the farm is different to that in commerce, where the turnover is several times a year. The farmer should be given all reasonable opportunity to borrow at moderate rates for those numberless improvements which are certain to repay their cost and better his economic position. In Europe, it has been recognized that co-operative buying, producing, marketing, borrowing or credit are vitally inter-related." Summed up, the advantages of co-operation are:—

(a) Co-operative purchasing of agricultural requirements and the co-operative sale of produce through the bulking and regularizing of consignments for cheap and prompt marketing.

(b) The purchase of farming implements necessary to this end with co-operation in their use.

(c) The purchase of pure seed, fertilizers, etc., through co-operation.

**Failure of
Existing
Conditions**

If, then, we have seen the failure, economically, of existing rural conditions in the older provinces, and agree that co-operation becomes an essential element in improving conditions, it becomes apparent that, to obtain more favourable results in these various directions, radical changes must be made. What has been said prepares us for the adoption of methods, which have already proved most profitable in more highly developed countries elsewhere. In Sweden, for instance, "the limit of land value for any single proprietor is \$20,000, while 270,000 parcels constitute two-thirds of the whole land, and 85 per cent of these are worked by the proprietors. In Denmark, 95 per cent of 250,083 holdings, in 1910, with a rural population of 1,700,000, were under 135 acres, and formed 70 per cent of the total acreage. In 1881, the total exports of butter, bacon and eggs were valued at \$11,500,000 and, in 1910, at \$91,500,000. In Ontario the total occupiers of farm lands decreased from 285,608 in 1891 to 220,801, in 1911, or 22 per cent, and the total owners by 16 per cent. In contrast, the population of the whole province increased from 1901 to 1911 by 340,327, but the total increase in the area of field crops for the same period was only 1.1 per cent. The increase in the value of farm lands for this period was 14 per cent. In Illinois the number of farms cultivated by tenants was 41 per cent in 1910; less land was cultivated than in 1900, and less products secured, yet farm land values increased in price by 96 per cent and half the counties showed a decrease in population at the end of the decade. Similarly, the aggregate population of Illinois, in towns over 2,500 population, was 63.2 per cent of the total, Chicago having 40 per cent of the whole state."

**Education must
go Direct to
Farmers**

But, when more favourable conditions along these various lines have been followed, there still remains the personal educational factor to be dealt with if better results are to be obtained. A provincial officer of the largest agricultural college in Canada has stated that farmers who have gone past his institution for a lifetime will, in many cases, still be found farming after the methods of their fathers of forty years ago; while one of the most experienced city food inspectors in Canada, after illustrating the backward conditions in portions of the rural districts under his charge, expresses the positive conviction that progress will be very slow until the friendly assistance of official experts, experienced farmers or rural demonstrators actually brings such matters as that of the improved dairy cow, the spraying of fruit trees or of selecting seed, directly to the farmer in his own home or to a local group of farmers, and, by actual results,

show them a better way. For the dairyman, with cows producing only 3,000 pounds of milk per annum, to be shown by illustration that his herd, through selection, may, in a few years, be producing 10,000 lbs. per cow per annum for the same labour, is like experiencing light shining in a dark place. Forty years personal observation of Ontario conditions convinces me that this experienced instructor is absolutely correct.

IMPROVED TRANSPORTATION AS AN AID TO PRODUCTION

When freight congestion is so acute that the people in every city in Canada are crying out for enough coal to keep them warm, it is difficult to even suggest improvements in transportation for farm products as a factor in our problem. It involves not only the problem of the regular movement of farm products, the careful handling and quick delivery of perishable products, but also a rate sufficiently low to make the returns to the farmer for his product reasonably adequate. As an illustration, the commission appointed by the Saskatchewan Government to study the grain market (1912) reached the conclusion that the cost of producing a bushel of wheat averaged 55 cents and that to meet the cost of haulage, elevator charges, railway and steamboat rates, the farmer must receive \$1.00 per bushel before wheat growing could pay adequately.

Variations in Freight Rates

An instance known to the writer occurred where a commission merchant of St. John, N.B., agreed to ship potatoes at 75c. a bag to a station near Toronto, the freight per carload being 23 cents per hundred pounds; for the same quality of potatoes bought at Ottawa for 80 cents a bag the freight charged to the same point was 36 cents per hundred pounds, while corn and peas per hundred in the same car cost only 16 cents per hundred, the whole making a part carload. Again, pears carefully packed in baskets, shipped on a night train, and arriving in Ottawa from a distance of 150 miles in perfect condition, cost so much for express that the sender got no return for his pears or labour after the express, commission and cost of baskets had been paid. These simple illustrations indicate that, no matter in what the fault lies, the effect of high freight rates has been one of the most discouraging factors in the solution of our problem. The illustration given of where the cost of potatoes was 36 cents per hundred, while that of grain was 16 cents, would seem to indicate something radically wrong with the basis of freight classification, apart from the larger question of excessive rates. Why potatoes, a crude form of starch, containing 83 per cent of water,

should cost more than twice as much to be carried in bags, in comparison with corn, containing almost three times the food substance, passes comprehension; but it will serve to illustrate the fact that many kinds of products could be grown in great quantities and most profitably in Canada if the problem of transportation were solved. The Railway Commission, in dealing with many problems, has constantly to meet the matter of over-capitalization and the interests of bondholders.

Earnings of Railway Employees and Agriculturists	In 1914, the gross earnings of the railways were \$243,083,539 and the working expenses \$178,975,259, or a ratio of expenses to earnings of 73.63 to 100, while the total employees were 159,142, with \$1,527 average earnings. The total value of the field crops in 1914 was \$638,589,300, earned by 933,735 farmers, representing one-half the population of Canada, who, with the assistance of their families, earned about \$683 per capita. With these facts confronting us we may justly question whether some other standard should not be possible when the total earnings stand at 1 to 2.8 while the workers stand 1 to 5.8. It would seem, therefore, that a branch of national work such as the railways, assisted to 1914, by loans to the extent of \$233,914,836, might direct some portion of these earnings to the betterment of agricultural production, which comes back so directly in the increased tonnage to be hauled, with a proportionately larger profit. Whether or not this can only be reached by the nationalizing of the railways may be open to discussion, but that agriculture should be assisted by a better regulation of traffic rates does not seem to admit of question.
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BETTER QUALITY AND IMPROVED METHODS OF CONSERVING PRODUCTS

The distinction must clearly be recognized, not only between the several kinds of farming but, also, between the old time grain and cattle farming and modern agriculture as an industry. The remains of great wharves may still be seen in San Francisco bay, Cal., where many millions of bushels of wheat once were stored, waiting for the clipper ships that transported it to Europe *via* cape Horn. These great crops of wheat have fallen off and a new phase of farming, of a scientific and intensive character, is gradually being introduced. Rural population increased more rapidly in California during the last census period than in any other agricultural State; and, to-day, the development of the citrus fruit industry is proceeding along the lines of scientific production and co-operative

sale more rapidly than is agriculture in any part of the United States. On the other hand, the census of 1911 showed fewer apple trees in Ontario than in 1901, and investigation shows that, while the cost of transportation to European markets has increased, as also that of picking and packing, the glut in the market in the autumn, due to the necessity of the early shipping, under existing methods, of so perishable a product, has made sales of one-third of the whole shipments unprofitable in Liverpool, owing to damaged fruit. The pre-cooling of small fruits, such as southern strawberries, at the time of harvesting, and a similar treatment of oranges and other citrus fruits has resulted in the building up of a trade in the United States of \$150,000,000 annually.

Losses through Careless Handling	An estimate was made in a Montreal packing house that when received, 20 per cent of the eggs were unfit for packing and the loss in this product alone in the United States in 1914 was estimated by the Department of Agriculture at \$50,000,000; while, during the present season, thousands of bushels of potatoes have been destroyed through carelessness in storage on trains and in permitting freezing in transit. One of the causes for the decline in cheese production in Ontario is neglect to store ice at the local factories so that its maturing at a temperature of 50° F. can proceed normally during the hot weather; while many thousands of pounds of milk are thrown away at the factories as unfit for cheesemaking because the farmers had not put up ice for cooling purposes. The Department of Agriculture at Washington, through years of practical work, has demonstrated that the summer trade in poultry for the great city markets may be readily developed when the birds are dressed and at once frozen, placed in cold storage, and shipped in refrigerator cars. Sugar beets may be stored at 32° F. for months, thereby lessening the number of factory labourers and extending the working months. Refrigeration maintains butter in perfectly good condition for months at zero temperature; but, at present, the profits for summer butter so stored accrue largely to the city warehouseman—a single warehouse in New York, in 1916, had 234,223 tubs of butter and 101,789 boxes of cheese stored.
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Evaporation to Preserve Food	The prevention of waste not only through the decay of foods, but also by lessening its bulk and thereby the cost of transportation, is not only possible through one of the oldest, but also one of the most recently developed methods, that of drying fresh products. Apples weigh 54 pounds per bushel, but can be preserved for months and years
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if the bulk is reduced to 7 pounds through drying to 20 per cent of moisture, while the cheapest fruits generally available many years ago were dried currants, raisins, prunes, and apricots, all from foreign countries. From these examples, we realize how great is the need and opportunity for adopting better methods in Canada for conserving food. Probably in nothing are our crude methods more evident than in the carrying of crude starch in that commonest of foods, potatoes, having 83 per cent of water, whereas we import other starches, represented by corn, rice, tapioca, etc., at a price made possible because of the small amount of water present. Drying potatoes will prove the first step in the regulation of the price. Evaporation is being used to prepare condensed and desiccated milk, both of which, properly carried out, have much to recommend them, both as regards the cost of transportation and of preservation.

Though there is but little inspection of the quality of the raw produce used and none as to the percentage of water in the product, we see the canning method of preserving food constantly increasing through its convenience and the business methods employed, notwithstanding it implies a costly package, occupying much space in the storeroom and in the car, where the cost is high in proportion to the bulk, mostly of water carried.

<p>Canning Costs Largely Increase Sale Prices</p>	<p>In 1911, the capital invested in Canada in evaporated fruit and vegetable factories was only \$510,065, utilizing materials worth \$171,593, and giving products worth \$448,929, while in the canneries the capital invested was \$5,512,474, the raw materials costing \$2,295,303, and the products valued at \$5,971,082.</p>
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The processes by which raw foods can be condensed or compressed while retaining their essential nutritive values, are being rapidly developed in many centres of investigation and, if the degree of heat utilized is such that no vital principle of the food is lost, it is certain that an element of cost, both of handling and transportation, could be greatly reduced. As another illustration, Western elevators have hitherto received in storage uncleaned wheat, on which farmers paid from ten to fifteen cents per hundred as freight to Fort William; there it was cleaned, reducing its bulk by fifteen per cent of the refuse on which freight had been paid. This waste material was shipped to Chicago and sold at from \$20 to \$25 per ton as feed for hogs, poultry, etc. By cleaning the grain locally this 15 per cent on which freight is paid could be saved, the grain standard proportionately improved and its value increased; while the waste would be kept for feeding at home.

Knowledge of Soil Productivity Equally important with these methods of conserving and marketing is that of more extended and improved knowledge of the elements of soil productivity. Most important advances have been made towards increased production, through the knowledge that legumes of all species have the property, not only of utilizing nitrogen from the air for growth but, further, of increasing, through their deep roots, its storage in the soil. Chemists are further pointing out the tremendous importance of the best methods for utilizing farm manure, especially by preventing the loss of its constituents into the air. It has been estimated that the loss to the farmers of Indiana through the waste of manure is \$15,000,000 annually. Fortunately, through experiment, it has been found easily possible, by treating such manures with calcium cyanide and acid calcium phosphate, to prevent such losses and at the same time prevent, through the propagation of flies, these manures from becoming a menace to health. Rock phosphates also, through admixture with manure and other organic compounds, will not only help to fix the nitrogen therein but also that the insoluble phosphates, if applied and mixed therewith, become gradually soluble and directly available as a plant food.

Care Required in Packing Fruits The refinement of methods in producing more and better orchard fruits, free from blemish, is an elementary condition of successful fruit growing; but the selection of a better type of package, with more careful picking and sorting, is becoming increasingly necessary to compete in the British and still more in the western Canadian markets. As yet no serious export of Canadian fruits to the United States has taken place, though, for a month, a market for northern strawberries and raspberries is possible there, after the fruits of the southern and central states are over. These fruits, grown close to the north shores of the Great lakes, are delayed in ripening even so long as the end of July.

If these numerous illustrations show what lies at the basis of increased production and wider markets with better prices, then everyone who has studied the problem or is interested in it will naturally ask himself how these desired ends can be effected. The things requiring to be done have been abundantly illustrated in this paper; but the problem of the methods to be adopted remains as yet largely unsolved in Canada. Nowhere are the methods required being better illustrated at present than in Great Britain. There for fifty years the *man-power* engaged in agriculture has remained practically stationary; and, while organization is seen

everywhere in the great branches of commercial business, this basic industry has been left largely to care for itself. So far as organizing the forces for effective work is concerned the same may be said of the situation as it has existed in Canada.

**Grain Growers
Organizing** Within recent years the grain-growers of the West have seen clearly what they want and required and are organizing to that end; but the intimate relation between city business and rural development remains in practice largely unrecognized. Many millions of capital have, within a few years, been devoted to doubtful mining enterprises and untold millions have been invested in vacant lands, in the hope of getting someone else to increase the value by cultivation, so that owners might obtain the unearned increment; but, as the figures already given show, actual investment by capitalists in agriculture in the East, to be pursued as an industry, has had but few illustrations. Thus almost nowhere have we seen capital invested in cold storage at rural points of production in the 333 miles between Toronto and Montreal, yet, if such existed, the fresh products could be at once stored in perfect condition. Indeed, few instances of intensive cultivation exist except where we see imported Belgians or Hollanders cultivating beet-roots and onions; while few co-operative associations are in existence to carry out the desirable methods already indicated.

**Co-operation
Must be
Scientific and
Practical** To the answer that such methods cannot be forced, we have only to turn to what war conditions have brought elsewhere. In France, in the beginning of 1916, the Government decreed that each rural commune should appoint a committee of farmers and that each canton should have its superior committee for organizing agriculture for increased production. It was recommended in the decree that action should be taken within a fortnight and enjoined all interested persons to co-operate. Nowhere does better machinery exist than in the municipal sub-divisions of most of the provinces of Canada for similar action, and, under the present demands of war time, such ought similarly to be taken. But, such action must be scientific and practical, since we see that, in Ontario, cheese factories, where the patrons have for years combined for production, the loose methods too often allowed resulted in a lack of real progress and good business results. Just as a census of the man-power of our communities for recruiting purposes is being made, so investigations and surveys, through local committees, guided in their work, should be carried on concerning the capital invested in specific ways, in the extent of such operations and in the degree of business success or failure and in the causes affecting both.

Farming Must
be Made
Profitable

But when more production has been secured and improved methods of conservation of foods adopted, such as cold storage or desiccation for increasing the relative value in relation to the bulk of food, have been carried out, the regulation of the purchase and sale of products becomes equally essential to the easy and natural evolution of agriculture. In England, at the present moment, owing to the firm hand of government, both the price to be paid the farmer for his products and the price he must pay for his labour have been determined; but, in the United States and Canada, food prices of every kind continue to rise, even though the submarine menace may place a practical embargo on exports. Speaking recently of English agriculture, Sir Rider Haggard said "To my mind, the trouble about agriculture, not only in England but throughout the world, is its comparative unpayability when contrasted with the earning of other industries. If agriculture is to thrive prices must be permanently enhanced and the labourer be better paid." We find this idea being acted upon when Lloyd George's legislation fixed the minimum price of wheat at sixty shillings per quarter and of labourers' wages at a minimum of twenty-five shillings per week.

Farmers Exert
Their Influence

If it be said that these methods are simply restrictive of the free expansion of trade, then it can be replied that, to place the men, who control unlimited capital and facilities for its use in cornering food supplies, as in the Chicago market, on the same assumed basis of opportunity as the individual producer is to make a farce of any discussion or attempted solution of the problem. Within two years past the farmers of at least two of the Western States have become dictators, in that they have elected a farmer governor and control both houses of representatives. The manipulators of prices are already setting up loud cries against this invasion of their privileges and prerogatives; but, at any rate, such legislators in their acts will have the virtue of representing the views of the people who elect them.

REQUIREMENTS FOR SUCCESSFUL SOLUTION OF PROBLEMS

If, then, we sum up the whole matter as it appears to us the following essentials would seem to be demanded for a real solution of the problem:

A scientific report, after careful enquiry of what past experience and present knowledge teach regarding what crops the soil of the different provinces, and even the counties in the same, is best fitted to produce abundantly.

A careful review of past market prices and prospective values of the various possible products in keeping with the demand, as well as the relation of the value of each to the cost after harvesting, transporting and marketing has been provided for.

The securing of loans, either alone or through joint action direct from government, as in Australia, where the savings bank deposits of the post office are loaned at low rates of interest and for long terms, or through other methods, as farmers' banks. Thus, the farmer will be enabled to improve land by drainage, use of fertilizer and improved implements, with a view both to present and future returns, without constant anxiety about repaying capital borrowed.

The co-operation of groups of farmers, through legally organized societies, in obtaining improved breeds of stock and best varieties of seed at best prices to be shipped in carload lots, as well as in pressing for such alterations in freight classification as will remove restrictions from certain classes of production equally detrimental to the railways through the lessening of local freight.

Adoption of modern methods for the pre-cooling and local storage of perishable products, as fruit, eggs, poultry and dairy products, so that sales in car lots can be made and deliveries made when the market is not glutted, directly through their own agent and without the intervention of unnecessary commission men.

The taking control in the matter of selling their own stock in car lots, in prices arranged by their own agent, instead of having the price set for them daily by the buyers of the packing houses on instructions from headquarters. Further, where the cattle interests are large, farmers should encourage cattle markets in the larger city centres, with their associated abattoir, where the local butchers could compete for prices, slaughter their own animals and sell directly to their customers, instead of, as at present, having all stock sent to Montreal, Toronto, Winnipeg or Calgary abattoirs, there to be slaughtered and the meat carried back again to where the animals came from, in express parcels, perhaps at double prices. The farmers must themselves act in conjunction with the cities to throw off this intolerable tyranny, which is degrading agriculture, and must become free to determine for themselves the place and time as well as prices at which they will sell their stock, the latter based upon world-wide rather than on local market prices.

The bringing to the door of the isolated farmers the best experience in the modern science and art of agriculture, through addresses and demonstrations, such as we see going on in many provinces today; and still more by having agriculture so universally taught in local farm schools and in consolidated public schools that the older boys and girls will learn, through actual demonstration and experiment, the science, beauty and dignity of agriculture; while Nature study, from kindergarten

up to the higher grades, will be so illustrated by school gardens, winter flower rooms and greenhouses that the facts will be indelibly impressed on the mind of the child as the elements of a science which is absolutely essential to be grasped if the agriculture of the future is to move forward on the same plane of progress as do the railways, shipbuilding, manufactures and a hundred industries made possible through steam and electricity.

To co-ordinate all these activities it will be essential that the homes, schools, churches, libraries and places of entertainment those of the farming community have cultivated in them amenities which modern life everywhere in our urban centres has made both possible and desirable. To this end not only must the farmer himself realize both his possibilities and responsibilities, but the rural clergy, teachers and other leaders must also appreciate at its full value the really national influence which the development of our rural life has upon the character, physical, mental and moral, and on the future of the Canadian people. If such do fully comprehend the situation it will then mean that the elected representatives of the people will come increasingly to understand that there are problems demanding the closest study, the best educated minds and the most patriotic endeavours for their solution. Thus, co-ordinating their energy with those of the people, we shall surely see evolved a wholly new social life, wherein, instead of mistrust, misunderstanding and hostility, too often at present seen in our legislatures between representatives of differing interests, there will be harmony marking all their deliberations; while there will be no country and no city separate from each other, or east or west divisions.

FIELD CROPS—CANADA AND ONTARIO, 1910-1914

Crops	Canada and Ontario	Average for 1910—1914	1910	1914
Wheat (Fall and spring)...	Canada..... Ontario.....	10,494,000 acres 836,000 "	8,863,151 870,355	10,293,900 834,400
Oats.....	Canada..... Ontario.....	9,671,000 " 2,819,000 "	8,652,015 2,871,288	10,061,500 2,840,000
Barley.....	Canada..... Ontario.....	1,501,000 " 505,000 "	1,286,611 503,129	1,495,600 461,000
Rye.....	Canada..... Ontario.....	123,000 " 92,000 "	114,343 92,731	111,260 78,000
Peas.....	Canada..... Ontario.....	283,000 " 249,000 "	355,262 321,996	205,550 179,000
Beans.....	Canada..... Ontario.....	50,000 " 43,000 "	46,149 40,626	43,830 38,000

FIELD CROPS—CANADA AND ONTARIO, 1910-1914—*Continued*

Crops	Canada and Ontario	Average for 1910—1914	1910	1914
Buckwheat.....	Canada..... Ontario.....	378,000 acres 186,000 "	361,871 167,313	354,400 176,000
Flax.....	Canada..... Ontario.....	1,259,000 " 8,400 "	582,326 8,780	1,084,000 5,300
Corn (husking)....	Canada..... Ontario.....	298,000 " 278,000 "	293,775 274,846	256,000 239,000
Potatoes.....	Canada..... Ontario.....	476,000 " 156,000 "	465,903 158,363	475,900 154,000
Turnips.....	Canada..... Ontario.....	192,000 " 131,000 "	177,423 132,529	175,000 114,000
Hay and clover....	Canada..... Ontario.....	8,336,000 " 3,328,000 "	8,281,932 3,216,154	7,997,000 3,171,000
Fodder corn.....	Canada..... Ontario.....	298,000 " 249,000 "	294,009 245,048	317,000 267,000
Sugar beets.....	Canada..... Ontario.....	18,000 " 17,000 "	17,045 15,966	12,100 12,000
Alfalfa.....	Canada..... Ontario.....	87,000 " 66,000 "	56,818 45,625	90,315 61,000

LIVE STOCK—CANADA AND ONTARIO, 1910-1916

		1910	1914	1915	1916
Horses.....	Canada.... Ontario....	2,213,199 809,949	2,947,738 904,975	2,996,000	2,990,635
Milch cows*.....	Canada.... Ontario....	2,853,975 1,243,680	2,673,286 1,083,843	2,666,646	2,603,345
Other cattle.....	Canada.... Ontario....	4,250,963 1,629,360	3,363,531 970,445	3,399,158	3,313,519
Sheep.....	Canada.... Ontario....	2,598,470 1,032,227	2,058,045 640,416	2,038,662	1,968,101
Swine.....	Canada.... Ontario....	2,753,964 1,481,055	3,434,261 1,555,624	3,111,900	2,814,672

* Milch cows, 1910, (1,065,763).

FRUIT TREES—CANADA AND ONTARIO, 1901-1911

		1901	1911
Apple trees bearing	Canada Ontario	11,025,780 7,551,636	10,617,372 6,710,033
Peach trees bearing	Canada Ontario	819,985 811,725	839,286 794,192
Plum trees bearing	Canada Ontario	1,452,269 999,091	1,075,130 784,036
Cherry trees bearing	Canada Ontario	903,140 446,556	741,992 506,868

CENSUS FIGURES, 1911, GIVING VALUES OF FARM PROPERTY IN CANADA

	All farm property	Land	Buildings	Implements	Live stock
Canada	\$4,231,840,636	2,519,777,901	823,951,767	257,007,548	631,103,420
Ontario	1,223,701,549	611,756,794	314,377,168	77,734,449	219,833,138

PERCENTAGE OF ONTARIO VALUES TO TOTAL

	Land	Buildings	Implements	Live stock
Canada—1901	56.36 per cent	22.15 per cent	6.08 per cent	15.41 per cent
1911	59.55 " "	19.47 " "	6.07 " "	14.91 " "
Ontario—1901	30.03 " "	11.82 " "	2.95 " "	7.38 " "
1911	14.45 " "	7.43 " "	1.84 " "	5.19 " "

The value of implements in Saskatchewan in 1911 was 1.36 per cent of the total 6.07, while that of Ontario was only 1.84 and that of Manitoba 0.66, showing not only the great increase of cultivation in Saskatchewan, but also how much more machinery is used there and of an expensive type.

ONTARIO

Total farm land, estimated.....	58,541,000	acres
“ “ “ occupied.....	22,171,785	“
Rural population in 1901.....	1,246,969	“
“ “ “ 1911.....	1,194,785	“
Occupied land, per person.....	18.7	“
Total tillable land, per person.....	50	“
Estimated value per acre in 1911-13, (average of five crops in Ontario over cost of production)	\$7.50	
(Fall wheat, spring wheat, oats, barley, flax, average value 16.77)		

POPULATION OF ONTARIO COUNTIES NOT AFFECTED BY NEAR-BY CITIES

	1901	1911	Loss	Loss per cent
Huron.....	61,820	52,983	8,837	17
Wellington (N).....	26,120	22,292	3,828	17
Hastings.....	59,291	55,803	3,488	7
Leeds-Grenville.....	40,275	35,767	4,508	11

Canada, total rural population in 1911	3,925,502
Ontario, rural population in 1911	1,194,785

SUNDRY STATISTICS, 1914

Total assets of chartered banks, 1914	\$1,555,556,815
Total loans “ “ “ “	858,090,078
At credit of depositors in Post Office and Dominion savings banks.....	55,567,449
Assets of loan companies, 1913	478,658,227
Amount of loans 1913	302,056,422
Net amount of life insurance in Canada in 1914....	1,216,955,432
Premium income.....	41,129,724
Steam railway mileage in 1914.....	30,795
Capital liability of steam railways in 1914—Stocks (including debenture stocks)	\$1,026,418,123
Funded debt.....	782,402,638
Total liabilities of railways in 1914.....	\$1,808,820,761

Dominion and Provincial Government aid to railways in 1914:

Bonds authorized.....	\$406,259,165
Bonds executed.....	710,268,624
Guarantees earned.....	235,473,394

ANALYSIS OF FINANCIAL AID TO RAILWAYS, TO JUNE, 1914

	By Dom. Gov.	By Prov. Gov.	By Municipalities
Cash subsidies.....	\$105,318,205	\$29,526,245	\$12,670,837
Loans.....	25,576,533	7,197,030	2,404,499
Paid to Quebec Govt.	5,160,054		
Subscriptions to shares		300,000	2,839,500
Value of lines given to C. P. Ry.....	37,785,320		
Implement Clause of G. T. P. Ry	4,994,417		
	\$178,834,529	\$37,023,275	\$17,914,836

Grand total..... \$233,772,640

Total Dominion and Provincial land grants
to railways to 1914..... 55,740,249 acres
Total aid to railways to 1914, loans, etc. \$233,772,640
Land grants at \$10.00 per acre..... 557,402,490

\$791,175,130

Of the total aid granted, in the form of loans, subsidies, etc.,
\$152,509,705 has been paid up.

The Prevalence of Venereal Diseases in Canada

*A Presentation of Facts and Figures by Members of the Faculty of
Toronto University and of the Staff of Toronto General Hospital*

GENERAL INTRODUCTION

BY

C. K. CLARKE, M.D., LL.D.

Professor of Psychiatry, University of Toronto

A FEW years ago when Superintendent of the Toronto Hospital for the Insane, it became apparent to me that gradually the admissions contained more and more cases of general paresis. All of these patients were, of course, suffering from syphilis. A careful survey of the figures revealed the fact that twenty-five per cent of the male admissions were syphilitic, a startling proportion.

When I transferred to the General Hospital service it was soon apparent that venereal diseases were steadily on the increase in the community, and, in a small clinic conducted for the feeble minded, no less than seventy-nine paretics came under observation in about a year. Many of these cases had congenital syphilis—in other words were the victims of an inherited form of this malady.

The prevalence of this disease among children—very largely the offspring of recent arrivals in Canada, was significant.

So commonly was the general out-door department attended by people asking for treatment for syphilis that we were forced to develop a special clinic for venereal diseases, open for three days and one evening in the week.

What happened when this was established, made us look further, and it was thought advisable to make a careful examination of the blood of every public ward patient entering the hospital.

What has been discovered in the clinic for feeble minded, in the special clinic and in the general wards, is the basis for an argument before this Commission.

The facts and figures to be presented to you by the speakers who follow me, will prove conclusively that the time has come for the establishment of drastic legislation to control the evil.

The situation is a serious one, and the importance of it will be thoroughly appreciated by those who have been following the world-wide movement for the suppression of venereal diseases.

When it is learned that more than 12 per cent of the patients admitted to the public wards of the Toronto General Hospital, for various diseases, medical and surgical, have syphilis, it will be realized that we are dealing with an acute situation, as the facts which apply to that institution are merely an index of the prevalence of syphilis in the community.

The menace to the health of the nation is perhaps greater than that of tuberculosis, as the problem is so much more difficult to deal with, and the subtle manifestations of the malady are so much more involved and obscure, as well as not easy to treat.

If registration of the tuberculous is desirable, the same argument is doubly applicable in the regulation of syphilis.

No false sentiment, no desire to shirk our manifest responsibility, should be encouraged. It is a case where a spade should be called a spade without the least hesitation.

In tuberculosis it is possible to control infection, in syphilis it is extremely difficult to do so for reasons that are self-evident.

One of these reasons is, that prostitutes are the source from which the greater part of the infections come—carefully compiled statistics showing that 75 per cent are traceable to the women of the street.

As 60 per cent of all prostitutes are feeble minded, a serious situation at once faces us in Canada, as very little intelligent provision has been made for the care of this class.

To show how this works it may be said that in our clinic a few weeks ago we had under observation at one time a feeble minded girl and five men she had recently infected with syphilis.

In the old world the problem has been faced for some years with varying success, and since 1874 and 1876 Denmark and Norway have employed a system of compulsory registration.

In England at the present time a large number of the best people in the realm are moving actively, as the menace has grown to such proportions, and in Canada we must find some solution of the present difficulties.

In Western Australia advanced legislation went into force on December 8th, 1915: Bill No. 55, of 1915; an Act to Amend the Health Act, 1911-12.

This is no doubt the most advanced legislation of the kind in existence, and deals with the following subjects, among others:

Venereal diseases, their treatment by medical practitioners only—

Persons suffering from these diseases must place themselves under treatment and keep themselves under treatment until cured.

Medical practitioners are to report cases of venereal diseases under treatment by them.

Name and address of patient to be reported on failure to continue treatment.

Certificate of cure to be given.

Bacteriological examinations to be made free of charge.

Compulsory examination and treatment under certain conditions.

Subsidized hospitals or salaried medical practitioners to give free treatment.

The prohibition of quack cures.

Secrecy to be preserved, etc.

The Act is an excellent one, and full of suggestions worthy of the greatest consideration in Canada.

In the city of New York advanced legislation is in force, and follows along the general lines indicated in the Western Australian Act.

Many educational pamphlets are also issued both in Australia and New York. These are available for public use. They treat of such subjects as the following:

To warn persons not infected.

To warn and instruct persons who are infected with these diseases so that they will appreciate the absolute necessity of treatment.

To arouse a desire in the persons who have been infected to know absolutely whether they have been cured.

It is a matter of opinion among the majority of sanitary officers that no distinction should be made between venereal and other infectious diseases.

If this be admitted there must be intelligent educational campaigns, proper prevention, effective isolation and persistent treatment.

Venereal diseases stand pre-eminent as a menace to the race and incidentally to the nation. The physical and social evils following in their wake are well known to the whole medical profession. When we realize the immediate and remote results of infection that is not treated, and contemplate the horrors entailed by a possession of these vile diseases, we shudder for the future of civilization, and marvel that the health authorities have not risen in violent protest long ere this.

In Canada we are rapidly reaching a condition not much better than that in the old world where venereal diseases have played

such a prominent part in the degeneration of the race. Not only that—we must not shut our eyes to what is likely to occur when the war is over and the returned soldiers are to be cared for. We might as well face the probabilities squarely and make proper provision.

In all armies venereal diseases are rampant—the armies of to-day are no exception to the general rule, and the proportion of diseased among those who have already come home is alarming and disturbing. We may well ask what shall the harvest be in the near future? There is abundant reason for anxiety, and those who remember what tragedies resulted after the Boer war will readily appreciate the force of our contention.

THE PATHOLOGICAL ASPECT

BY

J. J. MACKENZIE, B.A., M.B.

Professor of Pathology and Bacteriology, University of Toronto

Although the immediate effects of venereal disease on the individual are serious enough, their great importance from the standpoint of race conservation lies in their delayed effect upon the individual and his, or her, offspring. It is this aspect of the question which especially impresses itself upon the pathologist. Whereas he may not often see in the post mortem room the evidence of recent syphilis, he is continually being brought face to face with its delayed effects.

Syphilis is a disease due to a minute spiral organism called the *treponema pallidum*. Ordinarily this is transmitted from one individual to another through sexual intercourse. If this were the only method of transmission, however, the possibility of control and prevention might be a simpler problem. Unfortunately extragenital infection occurs oftener than people realize, and the prevention of these extragenital infections becomes one of the most difficult tasks of the sanitarian.

The organism, when it enters the tissue, as a rule produces, after an incubative period of from eight to ten days, a so-called primary sore. This primary sore presents well marked clinical features which enable the physician to recognize it, but if there is doubt, there are laboratory methods by means of which the diagnosis may be rendered absolutely certain. This primary sore tends to undergo spontaneous healing and a careless or ignorant person may not be

caused serious inconvenience. After a second incubation period of about ten weeks, the so-called secondary stage of the disease develops. This is in the nature of trouble in the skin, in the mouth and in the system generally, due to the invasion of the whole body by the parasites. In many of the secondary lesions, multitudes of the parasites are found, and during this stage the patient may be intensely infectious and especially liable to spread the disease by extragenital paths.

These so-called secondary manifestations of the disease may persist for months or even years, but they also tend to heal, and the patient may become apparently well, and properly treated cases may recover completely. Unfortunately, however, syphilis is a disease in which the parasite, following these primary and secondary forms, may remain dormant in the system for years. Sometimes, after many years, evidence of disease supervenes and the patient develops the so-called tertiary lesions. These are of the nature of chronic inflammatory and degenerative processes, which may occur anywhere in the body but which show a special tendency to attack the blood vessels and the nervous system. The effect of the disease on the blood vessels depends upon the vessels involved. For instance, the syphilis parasite shows a special tendency to attack the large artery which carries the blood from the heart, the aorta. As a result of this localization the walls of the vessel become weakened and dilated. This is what is called an aneurism, and to-day all aneurisms of the aorta are recognized as due to syphilis. The wall of the aorta, where it leaves the heart, is especially liable to involvement, with the result that the valves which guard its mouth fail to close properly and become incompetent, producing serious effects upon the general circulation. Whenever a patient of middle age with this form of heart trouble comes to a physician, he immediately suspects syphilis and he has a test of the blood made to exclude it.

The same tendency for the beginning portion of the aorta to be scarred by syphilis leads to an involvement of the coronary arteries, the arteries which nourish the heart itself. When this takes place the heart muscle is damaged and the patient shows the symptoms of that most terrible of all heart troubles, angina pectoris. Syphilis in its late stages is one of the most fruitful causes of angina pectoris. When the arteries of the brain are involved in the syphilitic process, the nutrition is cut off from the brain and the patient suffers from a paralytic stroke. In men between the ages of forty and fifty a stroke in the vast majority of cases is due to syphilitic disease of the cerebral arteries.

The microbe of syphilis shows a special tendency to become lodged and to remain dormant in the central nervous system. Lodged there, in later life it awakens to activity, and there results two diseases which are the most serious ones of the central nervous system, either locomotor ataxia, in which the spinal cord is mainly affected, or paresis, general paralysis of the insane, where the brain itself is involved.

All these late tertiary manifestations of the disease take a tremendous toll from the most important and active part of the community, and just at the age when their activities are of the greatest importance in the life of the community.

The most serious thing about these late developments in the blood vessels and brain is that it bears no relationship to the severity of the primary disease or its secondary symptoms. A patient may suffer from a relatively insignificant primary infection, may be only slightly inconvenienced by the secondary stage, yet he may die before fifty from the vascular or nervous troubles.

It is just on this account that it is essential for the state to institute control over diagnosis and treatment. The very nature of the disease leads to concealment and tends to throw the sufferer into the hands of quacks. Ignorance of the ultimate consequences and the promptness with which the primary and secondary lesions disappear under treatment is apt to lead to undue optimism in the patient. This optimism leads to too early cessation of treatment and the condition of dormant infection is set up, to be followed in later life by some of these serious late forms of the disease. It is upon this side of the question that the public needs more thorough education—that diseases which the public are apt to think of as the necessary accompaniment of the wear and tear of life are in many cases directly traceable to a venereal infection contracted in early manhood, and from which the victim congratulates himself he has completely recovered.

A recent writer upon the relation of syphilis to life insurance says: "No applicant who has had syphilis deserves to be considered a first class risk The average syphilitic will not live to his full expectancy Mortuary records show that diseases of the circulatory organs are the cause of death in over fifty per cent of syphilitics."

But perhaps the most terrible results of syphilis from the standpoint of race conservation are seen in its influence on the offspring. Syphilis is a disease which is transmitted from the parent to the child before birth. The result of this is either the mother miscarries or gives birth to a dead child, or if the child is born alive it

may die in early childhood from the results of the congenital infection. Even if it grows to adult life it, sooner or later, may show the same late forms of the disease in which the organs of circulation or of the central nervous system are involved. It may serve as a source for the further propagation of the disease, and may even transmit it to the third generation.

The severity of the infection in the child is not in proportion to the severity of symptoms in the parent. Mild symptoms or latency in the parent are often found with malignancy of infection in the child.

Innumerable statistics might be quoted to show the effects of syphilis upon the race from this standpoint, but the following observations of Kaufmann will suffice: "Among nine syphilitic couples there were sixty-six pregnancies; these included thirty-three abortions or still-births, and thirty-three living children. Of the thirty-three living children, twenty died—fourteen during the first year of life, three suicided, two were epileptics, and one died at the age of forty. Thirteen are still living, of whom only two are normal."

THE BORDET-WASSERMANN REACTION IN SYPHILIS

BY

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In the diagnosis of syphilis, as in the diagnosis of any other condition, we make use of all the data at our command, and it is only by so doing that scientific accuracy can be hoped for or attained. The study of any case divides itself naturally into two phases—the clinical study, and the laboratory findings. While the importance of the former should never be minimized, it is nevertheless true that the tremendous advances in the fundamental laboratory sciences, especially in recent years, have emphasized the enormous value of certain laboratory tests and have shown us how many things had been missed before the advent of these methods of study. In no other single disease has the aid of the laboratory been so invaluable as in syphilis, and the statement, extravagant as it sounds, may also be unhesitatingly made, that no single laboratory test has so revolutionized our ideas on any disease as has the so-called Bordet-Wassermann test done in the case of syphilis.

This test was the outcome of a series of brilliant researches by two Belgians—Bordet and Gengou—elaborated later on by others until it has attained its present high degree of efficiency. It is a complicated test, requiring expert laboratory training and accurate scientific knowledge, along with much experience in its performance and interpretation.

By means of this test we are able to detect the presence of syphilis in approximately 98 per cent of all cases, excepting in the very early stage, in which case we have other tests which lend themselves admirably to the circumstances. A strongly positive Wassermann test, done in a reliable laboratory, has now come to be regarded by the best authorities as certain evidence of syphilitic infection.

The only other diseases which are conceded to give a positive test are certain tropical infections which are very easily ruled out, and these, moreover, are exceedingly rare in this country.

By means of this test we have learned some astounding facts concerning the prevalence of syphilis in our population. In the Toronto General Hospital, where we do a test on every case admitted to the wards for any ailment whatsoever, we have learned that between twelve and fourteen per cent of admissions are syphilitic. These figures are borne out by investigators in Great Britain and the United States. What is even more illuminating is the fact that the great majority (66 per cent) are not suspected of suffering from the disease. This is due to the following well-known facts: (1) Syphilis is a mimic and can simulate almost any known disease; (2) there is a so-called latent stage of syphilis, in which the patient shows no evidence of being infected—feels well, looks well, and on physical examination exhibits no lesions. Yet that patient is a menace to the community on account of his or her ability to infect others, or to bring syphilitic children into the world. Then again, such a patient is living on the crater of a volcano, for the dormant infection may light up at any time. The Wassermann test has done a great service in enabling us to detect this type of case. Let me mention only one other condition—the etiology, or cause, of which has been cleared up by this test. I refer to general paralysis of the insane. It is only in recent years that we have proved beyond doubt that this is a late, but none the less direct, result of syphilitic infection. The test has also served a most useful purpose in the detection of juvenile cases of this disease—the result of congenital or hereditary infection.

It is not only in diagnosis that the Wassermann reaction is of assistance, but it finds a wide use in following the progress of treat-

ment, and no patient is now discharged as cured until his test has been consistently negative for months or even years after treatment has been completed. This application of the test can not be emphasized too strongly, for many cases where treatment has not been sufficiently thorough, seem to slip back as time goes on and finally yield a strongly positive test. Such a plight would be entirely overlooked were this test not available.

It is not our purpose at this time to go into technical details, for it would be tedious and would serve no useful end. It is necessary, however, to merely mention in passing, some of the facts about this laboratory procedure in order to impress upon everyone the importance of properly equipped laboratories, and, above all, properly trained workers. In Toronto, and apparently it is no exception, there is a tendency to regard the Wassermann reaction as a simple routine measure not requiring skilful technicians and expert supervision. The result is that, in the past, the profession and the public have suffered from erroneous results and doubtful reports. Nothing will so quickly bring discredit upon this important procedure as quackery and incompetence. We have no protection from that sort of thing at present. A similar test to the Bordet-Wassermann reaction for syphilis has been devised for the detection of generalized gonorrhœa, and, while its application is not as wide as the former, it is nevertheless coming to be regarded as a requirement in routine of all well-equipped laboratories. It is even more difficult to perform, and the interpretation of results is, of course, all the more important.

When it is remembered that the test is accomplished by the use of the serum from guinea pigs, sheep's blood, immune rabbit's serum, extract of human heart—as well as the patient's blood, and that these various ingredients require much attention, proper scientific knowledge and absolute accuracy in their preparation and use, it will be easily recognized that such an important test should only be done in well-equipped laboratories by properly trained medical graduates. These laboratories require to be generously financed by the state, so that they may not be handicapped in their usefulness. They should be under the control of, or at least inspected by, the departments of pathology of the various universities, or other recognized authorities, so that the medical profession and the public may be assured that the reports issued from the various laboratories are to be relied upon. We strongly urge this point as one of the most vital and far-reaching factors in the campaign against venereal disease.

STATISTICS OF PREVALENCE OF VENEREAL DISEASES

BY

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Chief, Special Treatment Clinic, Toronto General Hospital

When one begins to obtain any authentic statistics on the prevalence of venereal diseases in this country, the very evident fact that there is no registration of the same makes it apparent that one can only draw some definite conclusions from the statistics of other places and from the complications of these diseases. This fact is emphasized in the *Report of the British Royal Commission*, published in 1916, as to their prevalence in Great Britain.

(Sec. II, C. F., Memo, Appendix 1). The death rate per million of population, from four causes of death, as considered from the *Registrar-General's Report* for the year 1910,—viz:

	Syphilis	General paralysis of the insane	Locomotor ataxia	Aneurism
England and Wales.....	46	62	16	31
Scotland.....	42	48	14	36
Ireland.....	22	17	10	11

Paragraph 14, Section II, emphasizes the fact that these reports furnish no adequate estimate of the prevalence of venereal disease.

In considering gonorrhœa no attempt is made to report the prevalence, but some of the sequelæ of gonorrhœa show its prevalence. A very large percentage (p. 28, par. 85, of above report) of pelvic inflammations in women is due to gonorrhœa. Of sterility in women (p. 28, par. 86) 50 per cent of all causes is due to gonorrhœa. Of 1,100 cases of blindness in children, 24·3 per cent was due to gonorrhœal infection of the eye (p. 31, par. 97). Of 102 children, 41 cases were traced to corneal defects from gonorrhœal infection of the eyes, probably at birth. Some startling statistics of the effects of syphilis on national life are given. (P. 30, par. 93.) Evidence shows

possible transmission of the disease to the third generation. The most prolific cause of miscarriage and premature birth is syphilis. Thirty-four syphilitic mothers, with 175 pregnancies, only gave birth to 30 apparently healthy children; 104 were premature births, still births, or deaths in infancy. Of 22 married women suffering from locomotor ataxia (p. 30, par. 94) 7 were sterile, and 69 pregnancies occurred, with only 10 living children.

Veeder, in the *American Journal of Medical Science*, claims that 10 to 30 per cent of syphilitic marriages are sterile and 13 per cent result only in abortion. Out of 331 pregnancies in 100 syphilitic families, 131, or 40 per cent, died before birth, 15 per cent died shortly after birth; total of 55 per cent died, 35 per cent living but syphilitic; 10 per cent only escaped syphilis.

On p. 30, par. 94, the same report deals with eye diseases and blindness caused by syphilis. Of 1,100 children in the Blind schools, 31.2 per cent was due to positive syphilis, plus a probable 2.8 per cent. (P. 30, par. 95.)—Ear diseases and deafness: 25 per cent of congenital deafness is due to syphilis; of 845 children deaf, 7.2 per cent was judged due to congenital syphilis.

Another startling statistic given in this report of the national loss is that England and Wales spend annually in asylums for the syphilitic insane \$750,000.

In view of the above findings, these facts are of an especial significance to Canadians, as many of our immigrants of the past, and many of the future, will come from the Mother Country. The loss of child life from this disease is appalling, and when the congenital effects or defects are added, the question is one of very great importance to the nation.

Let us consider the prevalence of venereal disease, as published in the *Report of New York City Department of Health*, 1914. The following number of cases were reported: Syphilis, 21,155; gonorrhœa, 9,526; chancroid, 517; total, 31,198. They also have an advisory clinic connected with the Department of Public Health. At this clinic, in the first six months of 1915, 1,389 patients attended and the source of infection was sought. The majority of these cases were males. A history was obtained in 803 cases. These showed that 70 per cent of the infection was through the public prostitute, 25.5 per cent due to the clandestine prostitute and 2.5 per cent the result of wedlock. The department claims that there is as much syphilis as tuberculosis in New York. Of the six million people in New York city, 25 per cent have venereal disease of some kind. The department reports that 10 out of every hundred have syphilis; 8 out of every 10 men and 5 out of every 10 women have

had gonorrhœa *at least once*. (Pamphlet on *Venereal Diseases*, published by the Department of Health, city of New York.) Nearly 5,000 people die annually in New York city as the result of syphilis. Nearly one third of the serious operations on women are due to gonorrhœa.

One further amazing statistic of the prevalence of syphilis in the United States is published in the *Army Reports* from two of their recruiting depots, consisting of about 2,000 recruits between the ages of 20 and 30, selected from 98 different occupations in life. Of these, 16·7 per cent were found to be syphilitic, and, the report adds, there is reason for believing that the percentage may be 20 per cent.

That syphilis is a menace to public health is becoming so apparent that one feels that most stringent methods must be adopted to control its spread. This is further proven by the fact that the blood tests establish its existence without the patient having any knowledge of how the disease was contracted. Dr. H. N. Cole, of Cleveland, in the December, 1916, number of the *Journal of the American Medical Association*, reports 61 cases of primary syphilitic sores occurring extra-genitally, as follows:

Ages	Cases	Ages	Cases
5 - 10 years.....	4	40 - 45 years.....	6
10 - 15 "	0	45 - 50 "	1
15 - 20 "	3	50 - 55 "	2
20 - 25 "	7	55 - 60 "	3
25 - 30 "	13	65 "	1
30 - 35 "	16		
35 - 40 "	5	Total cases.....	61

Of these, 33 were married and 28 single.

The sores occurred as follows:

Lips.....	43
Tonsils.....	3
Tongue.....	1
47, or 77 per cent, in buccal cavity	
Hand.....	10
Neck.....	1
Jaw.....	1
Abdomen.....	1
Breasts.....	1

Let us now consider the province of Ontario. If we take the *Registrar General's Report* for 1915, one would think that venereal diseases were not a great factor in the death rate in the province. On p. 25, Nos. 37 and 38,—*Syphilis*: Number of deaths caused by

Syphilis (including cities and towns of Ontario) . .	48
Caused by gonorrhœa	4
	<hr/>
Total	52

However, many other diseases result from syphilis, the more generally recognized being as follows:

Locomotor ataxia, which caused..	49 deaths (p. 27)
General paralysis of the insane . . .	76 deaths (p. 27)
Diseases of the arteries, atheroma and aneurism	1,242
	<hr/>
	1,367

In the last entry there may be doubt of its accuracy, as no distinction is made between aneurism and diseases of the artery, but this is more than offset by the fact that a great many deaths from angina pectoris and some of the other diseases mentioned are undoubtedly due to syphilis.

During the past thirteen months a syphilitic treatment clinic has been introduced in the out-patient department of the Toronto General Hospital, the patients being referred from the other clinics' and the results give a fairly accurate idea of the prevalence of the disease. Clinics held, 152, at which 373 patients have been treated. Of these, 28, or 8 per cent, only were treated in the primary stage of the disease; 70, or 18 per cent, in the secondary stage, and 206, or 55 per cent, in the later stages of the disease. The remaining 69 cases were: Congenital, 7; quiescent, 24; not classified, 38.

We have done 871 blood or Bordet-Wassermann tests, with 344 of these being positive, or 40 per cent. The number of intravenous treatments given was 1,595 to 298 patients. Our records show that 34 per cent are married males and 31 per cent married females, or 65 per cent married, representing 30 families. In these families, there have been 54 miscarriages or dead infants, showing the dreadful loss of child life, while some of the living children undoubtedly have congenital syphilis. In three families the fathers have died in the asylum or have syphilis of the nervous system, and some of

their children are infected. Since October 6, 1916, routine Wassermann tests have been done in the wards of the Toronto General Hospital, and out of 971 tests, 125 have shown positive syphilis—between 12 and 13 per cent.

In view of the above statistics it is apparent that the control of venereal disease becomes a question of national importance, not only from the standpoint of the economic loss, but also from that of the preservation of life, the wastage of which, in this present world crisis, one feels will be hard to replace.

GONORRHŒA AND ITS SEQUELÆ

BY

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The disease syphilis has been discussed in its various aspects by the previous speakers. It is my duty to put before you certain facts regarding gonorrhœa, more especially as it affects the female.

There can be no question that gonorrhœa is very prevalent in Toronto and also in Ontario. In the wards set apart for diseases peculiar to women these cases form a large proportion of those treated. I have had considerable experience in similar wards in the Royal Infirmary, Edinburgh, Scotland, a hospital serving a city of almost the same size as, and a country district not dissimilar to, that surrounding Toronto, and I have no hesitation in saying that many more cases of gonorrhœa and its complications are admitted to the wards in Toronto than to those in Edinburgh.

Out of a total of 329 operations performed in the said department of the Toronto General Hospital during the past year, 40, or over 12 per cent, were undertaken for the relief of conditions directly due to gonorrhœal infection. When we take account of major operations only, 25 per cent were performed for gonorrhœal complications. These figures do not differ materially from New York hospital statistics. They take no account of the number of patients who recover without operation.

The classes of women suffering from the disease are prostitutes, feeble-minded, domestics, clerks and married women. It is important to note that, of the 40 cases I have mentioned as requiring major abdominal operations for gonorrhœal infection, 28 were married and 12 single. The married women were in nearly every case innocent victims of infection conveyed by their husbands. The latter, too, in many cases were innocent to the extent that they believed themselves to be no longer infective. Had they been placed under a proper system of treatment and control and been warned of the danger of their condition, their wives would have escaped.

The tremendous importance of all this lies in the fact that gonorrhœa in the female is a very serious condition, much more so than in the male. It is serious from the following points of view:

(a) The disease tends to spread from the primary site of infection up into the uterus and into the Fallopian tubes, and so to the peritoneal cavity, a condition of affairs which puts the patient's life in jeopardy. If she recover, it is often only to lead the life of a chronic invalid or to have to submit herself to an extensive and mutilating operation which renders future child bearing impossible.

(b) Apart from the above severe complications, sterility very often results from milder attacks. Probably 50 per cent of all cases of sterility in the female are directly the result of gonorrhœal infection. From the point of view of the conservation of the race, this is one of the most serious aspects of the question.

(c) In the female, the disease often assumes a latent form which is extremely difficult to recognize. Treatment is difficult and it is not easy to be sure when a cure is effected. The possibilities of spread of the contagion from the individual female are thus very much greater than from the individual male.

(d) If a woman be suffering from gonorrhœa at the time of labour, her child runs a great risk of developing ophthalmia. Forty per cent of all cases of congenital blindness are due to this cause.

A consideration of these facts shows the great loss to the state resulting from gonorrhœal infection, a loss expressed by:

(a) The diminished working capacity of the individual and the frequent necessity for maintaining her in hospital or elsewhere.

(b) The diminished birth rate.

(c) The birth of permanently disabled children.

CONCLUSIONS AND PRINCIPLES OF CONTROL

BY

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The control of venereal diseases would not be a matter of importance if the results were confined to acute symptoms of the recently infected, but the necessity for action lies in the fact that the immediate symptoms are trivial when compared to devastations of its later manifestations. These manifestations are so numerous and varied that the possibility of venereal disease must always be considered by the physician or surgeon. The loss to the country by death in the prime of life of many an able man through aneurism, angina pectoris or vascular diseases of syphilitic origin can be appreciated by anyone who allows memory free scope. The loss and the expense by reason of nervous affections, such as general paralysis of the insane and locomotor ataxia, amounts to many hundreds of thousands of dollars a year. These examples can be readily grasped, but there are few statistics which can give any idea of the loss through the innumerable manifestations which go by masking names or are classed with like affections of other origin. The statistics which show that from 12 to 14 per cent of hospital cases are syphilitic only tell part of the story. Here only latent cases discovered in the course of routine tests, and those so far incapacitated by the disease as to be confined to bed, are included. To these must be added the ambulatory cases, with or without symptoms, which can only be definitely diagnosed as syphilitic by means of laboratory tests, and the cases of those who are inhabitants of asylums, homes for incurables, and homes of the "poor house" class. The loss alone through sterility, non-productive pregnancies, early death and mental deficiency is such that no country can afford to view unconcerned this aspect of venereal disease. The individual who has ever been infected and knows that tests for cure exist, should not be given the chance of ruining family life, depriving the state of healthy citizens, and burdening it with physical and mental defectives.

These statements, and much that has just been given by the former speakers, may seem exaggerations to those who are not in touch with the advances in bacteriology and the perfection to which sera tests have been brought. The revelations coming from

the scientific laboratories have not only confirmed the impressions of physicians as to the venereal origin of many affections, but have shown that many unsuspected affections are of that origin. These revelations have changed beliefs to well established facts from which a feasible system of control can be deduced.

The viruses of venereal disease are of such a character that their transference from one individual to another usually requires personal contact—a contact so definite as to bring the moist surfaces of mucous membranes or abraded skin together. Rarely is the transfer made by other means, such as through the agency of inanimate objects—though one can readily understand why much is made of this possibility.

The mentally deficient recruit the ranks of the prostitutes and show the most neglected forms of venereal diseases in the infective stage.

The virus of syphilis can be readily transmitted for some months by the recently infected individual. After this varying period the danger of transmission decreases for any single contact. After six years, even without treatment, transmission is improbable. Early and vigorous treatment shortens the infective period, even though the virus is not entirely destroyed in the body of the individual. The virus can be demonstrated in the primary and secondary lesions by trained workers. The Bordet-Wassermann test and the Noguchi test, as conducted by the scientific laboratories, are reliable up to 98 per cent.

The virus of gonorrhœa is more readily transferred by the recently infected for many weeks and months. The danger of transmission decreases after several months, but may still exist for several years even though there are no evident symptoms. Treatment is uncertain in its results. Bacteriological tests readily demonstrate the virus in the acute stage but the help of the scientific laboratory is required in the chronic stage and for the proof of cure. In both acute and chronic stages of the disease in women it is more difficult to demonstrate infection.

The transference being by direct and intimate contact, the control of the disease must entail the supervision and the treatment of the infected during the period when such transfer is probable. An absolute control by isolation is out of the question for obvious reasons. A partial control could enforce treatment during the infective period, while the contracting parties in marriage could be protected by blood tests and medical examination.

Even though control might not show an immediate lessening of venereal diseases, yet the spread of knowledge that is entailed by enforcement of some form of control, would eventually produce this result and lead to demands for more stringent measures.

The essential features of any measure for control should include:

1. Non-public registration
2. Public registration and isolation of recalcitrants
3. Free treatment
4. Free tests
5. Supervision of mental deficients
6. The administration of the plan by a Dominion body through the Provincial Board of Health.

(1) Registration of cases of venereal disease can only be made effective by securing the information from the physician to whom the infected person applies for treatment, and by shutting off all other sources of treatment. Severe penalties would have to be imposed upon others offering, selling, or advertising medication for the treatment of venereal diseases. Any person developing symptoms must apply for treatment within three days of the onset. Any person wishing to discontinue treatment from any physician must either secure a certificate that he is undergoing treatment by another physician or secure a certificate of cure from the Board of Health. Release from treatment to be obtained when examination and tests show that the infective period is passed.

(2) Public registration and isolation by the Board of Health should be enforced where any person shall knowingly transmit any venereal disease and where any person shall discontinue treatment during the infective period.

(3) Free treatment is absolutely necessary for the great majority of infected individuals, not only because of the cost, but because every inducement should be offered to prevent concealment and treatment by quackery and nostrums. All local Boards of Health should post and advertise the fact that free treatment can be obtained from approved hospitals, clinics and salaried physicians. All hospitals, clinics and medical institutions receiving grants from the Dominion or the Provincial Governments, and any physician in receipt of salary from the Provincial Government or Local Board of Health, shall provide free treatment.

(4) Means for the efficient carrying out of tests for diagnosis, prognosis, and proof of cure, must be provided free of cost. The whole plan stands or falls according to the efficiency and accuracy of these tests. Not only are trained technicians needed for the carrying out of the bacteriological and sera tests, but close and frequent supervision by the trained bacteriologist and serologist is required to ensure the accuracy of even the standard tests. To accomplish this supervision, there are at present available the laboratories of the universities of the Dominion.

(5) The supervision of mental deficient is necessary for efficient control of venereal diseases, because they are unfit to understand their responsibilities, and it is from this class that the majority of prostitutes and moral perverts are recruited. This class should either become the wards of the state, or be rendered innocuous by reverting to the logical but extreme measure of unsexing.

(6) The administration of any plan of control should be in the hands of a body provided for by the Dominion Government. Under this body the Provincial Boards of Health could carry on the work in the province directly or indirectly through the municipal Boards of Health.

The cost of administration should be borne by the Dominion, the provinces and the municipalities in such a way that the control remains with the Dominion to such an extent that fear of expense and local influences will not interfere in the effective and uniform enforcement of the measure.

Dominion control is necessary for the reasons that immigration laws are made and enforced by the Dominion, and also that the Dominion Government has the sole control of the militia and the returning soldiers.

DISCUSSION

MRS. SMILLIE: Now that we have had the scientific side so ably presented to us, we women would like to inform the Commission that the National Council of Women, ever since 1909, has had this subject under serious consideration. The well-known Dr. Prince Morrow, of New York, had, as his assistant in this great work of instruction in the United States, his cousin, Dr. Rosalie Morton. At the National Council of Women's meeting in Toronto in 1909, Dr. Rosalie Morton was present and addressed a meeting of women. We women then realized that the sins of the parents were being visited on the children unto the third and fourth generation, and that the purity and efficiency of our race was at stake. We have, in our quiet way, tried to educate our women throughout Canada, and to keep them informed as to the progress of the law both in New York and all over the United States; and, since the war commenced, we have felt that the question of this disease was seriously hindering recruiting in Canada. The mothers, in consultation all over Canada, would say: "While we expect our boys may be killed by the Germans, we do not expect our boys to contract this terrible disease in camp life, either in Canada or in Great Britain." Since then the military authorities have taken steps to control

venereal disease in camp life. But the question is now before us for the whole of Canada, and at our executive committee meeting at Kingston, in November, this subject was seriously considered again in the light of the revelations in the report of the Royal Commission in England. We drew up and forwarded a resolution to the Provincial Boards of Health, asking for better control and treatment of venereal disease and scientific education of the public on the subject. We have the pamphlets issued by the National Council for Combating Venereal Disease in England, also the Western Australian pamphlets, which were a revelation to us. At our meeting in Kingston, we were told that the return of infected soldiers to Australia had awakened that Commonwealth to this question, and hence their drastic regulations. Whatever the scientific men of Canada do, the best women are behind them, and we want to tell them so.

DR. JONES: The facts presented to the Commission this morning are of startling importance. A question comes to my mind, however, regarding the remedy. We cannot hope for any very strong action in the immediate future by the Dominion Government, as matters of this kind pertain more to the jurisdiction of the provinces.

It is a matter of public health, and matters of public health are very largely in the hands of the provinces. It is in the hands of the Dominion only so far as immigration and the Dominion features of public health are concerned, and the spread of disease from one province to another, which scarcely applies to this case. The Provincial Boards of Health should be approached for any immediate results. In every movement of this kind we must apply pressure.

I was interested in the statement of Mrs. Smillie that a resolution had been forwarded to the Provincial Boards of Health. I am a member of the New Brunswick Provincial Board of Health, and I heard nothing of this communication. Very often these communications are never brought to the attention of the Board by its medical officer. It seems to me that this Commission, after the evidence we have had this morning, may be able to present something to the Provincial Boards of Health which will lead to action. We should at once bring this matter before the provincial authorities, not overlooking the fact that we may be able to do something through the Dominion Government.

SENATOR EDWARDS: This is too serious a matter to be put off. Public health is a divided jurisdiction, but, as a precedent, the Dominion Government has assisted materially in the tuberculosis campaign since the beginning. I must say, frankly, I believed tuberculosis was the dread disease, and that everything else was insignificant; but, from what we have heard this morning, here is a disease compared to which tuberculosis is a simple thing. My conviction is that, if a strong resolution is adopted here and placed before the Dominion Government, they will take action at once.

LIEUT.-COL. ADAMI: We all agree that it is most important, in a matter like this, to interest everybody, and, if possible, the provincial governments ought to be induced to take a primary part in the work. Nevertheless, the danger of depending on the provincial governments is that we will have different legislation in the different provinces and have irregularities. It is wiser to have one central body, and, as Senator Edwards has stated respecting tuberculosis, a national body, with general direction of the work, would have been an advantage. We have had irregular legislation, and, consequently, have not secured the same results as if we had had Federal legislation affecting all Canada. Saying this, I cordially agree that we must secure the co-operation of the provincial governments.

As an officer of the C. A. M. C., I am keenly interested in this matter as affecting soldiers. At the last meeting which I attended, in London, of the National Society for the Suppression of Vice, there was some very plain talking. The meeting was held at the College of Physicians, and presided over by the president of the college. Much time was taken up in a discussion of this question of venereal disease among the soldiers, what had been done in respect to the Canadian soldiers, and what their condition was. A very distinguished physician, the spokesman for the committee working on the subject, pointed out that they had had wonderful success; that they had had great difficulty in persuading the local municipal authorities to undertake the suppression of harlotry, but, after some months of work, they had persuaded the Council of Folkestone to appoint two women policemen! Two women policemen to more or less control and look after the *entourage* of 40,000 or 50,000 men! And then, sir, Surg.-General Carleton Jones rose, and hit straight from the shoulder. It was a large hall, practically full of serious English people, leaders of public opinion, women and men, and he told them straight that they were hypocrites; told them that they were sitting there smugly, discussing the position and condition of the Canadian soldiers, when just a few hundred

yards away was the Empire theatre; that they were there like ostriches with their heads buried in the sand, and did not recognize that it was London that was the great foul, festering sore. They did not recognize that the Empire theatre and other leading music halls, which they were permitting, and seemed to look on as something of perfect respectability, were the places where soldiers and officers went and made assignations with women. He told them they were doing nothing to put a stop to this, that their attitude was: "No, we are a good people, we do not indulge in these things, and, furthermore, the country does not; therefore, they do not exist." General Jones pointed out the number of infections of men on leave, in London; he spoke so strongly that, from that very day, there was noticeable a great improvement and stirring up of British sentiment in respect to the dangers which beset the soldiers, the first sign of which was that the manager of the Empire theatre announced voluntarily in the press that he had done away with the 'promenade.'

It is true that conditions in Canada are very bad. You must not say: "Here are our poor Canadian soldiers, who have gone over to Great Britain, there got infection, and have come back to Canada, where they will spread that infection." In camps near large towns, we have bad conditions, and they must be met. The number of Canadians going to England with venereal disease has become serious, and is a cause of complaint from the authorities on the other side.

It is true that conditions in England are serious, especially to our men. We, in Canada, are not accustomed to see prostitutes upon the street and to have them accost men. That is common in the large towns in Great Britain, especially in London, and in other towns near camps. This is undoubtedly a very grave temptation for our men. They see nicely-dressed and nicely-spoken women, who smile upon them and address them. Our men, perhaps, have come from the country; in many cases they regard these as superior women, such as they have never seen in their native villages. They have never seen women so well got up, so willing to talk to them. It is bad for our men; but, granting all that, granting the dangers our men are exposed to, and especially the fact that they are in early adult life, are in magnificent training, and have been living in the open air, and that physiologically speaking, they are in a condition to be very sorely tempted—the marvellous thing is that we have had so little, not so much, venereal disease in our troops. A very large proportion of our men have withstood the temptation and have

done loyally. That should be told, and that should be remembered. These men are a credit to Canada.

Something has to be done. The time has come, both for our army and for the general community, when comprehensive measures must be taken to curb this disease, whose effects are not simply temporary but are of long standing, disastrous, not only to the welfare of our womenkind, but also to future generations. That being the case, as a community we have to consider, and the Government has to consider, what remedies must be applied. In the army we are now endeavouring to institute such a treatment after infection that the danger from this disease may be minimized. We cannot do anything in advance, as that might be regarded as encouraging immorality; but we can now promulgate measures whereby, through early treatment, excellent results are being obtained. A report from one province shows that, in the last two months, the incidence of venereal disease has been reduced by one-half. We have to do this for the women of Canada and future generations. Our first consideration must be that this terrible disease be stopped.

Canada owes a debt of gratitude to the members of the Medical Faculty of the University of Toronto, who have brought before us in this clear way, so admirable a presentation of the whole case; they have treated the subject in such a strictly scientific manner, and substantiated their argument with figures, that anybody can understand. With this evidence we must now force legislative action in this most serious matter.

DR. P. H. BRYCE: The facts regarding this matter have been so fully set forth that I desire only to refer to two or three points not brought out in the discussion. The first is the remarks of Dr. C. C. Jones with regard to the position of the Dominion in matters of public health. Our Chairman and other members here will remember very well that, in 1910, Sir Clifford Sifton had a conference of the Provincial public health authorities with the Federal officers and this question of the provinces having the supervision of public health laid upon them for the whole of Canada was thoroughly threshed out. As a matter of fact, the British North America Act has not one word in it with regard to public health. All there is in it is a provision that the hospitals and refuges and charitable institutions of Canada will be referred to and taken care of by the several provinces. The law lords long ago decided that all matters not specifically placed upon the provinces automatically become the duty of the Dominion Government; in other words, all that is not specifically allocated to the provinces is actually for the Dominion to carry out. We know, as a matter of fact, that, in the early days,

to meet their own needs, as the Dominion Government had done nothing in the matter of public health, the provinces established Public Health Boards. I was the first officer in Ontario to have charge of the Public Health Service, so I know very well the whole history of the work. With regard to the meeting in 1910, the Conservation Commission passed resolutions urging that, in the matter of tuberculosis, the Dominion Government should set apart specifically a certain amount of money per capita for every tuberculous patient officially recognized by the various provinces through sanatoria or anywhere else. So, clearly, seven years ago, this Conservation Commission went on record as having positively settled the matter in its judgment in regard to the position of the Dominion in the matter of public health.

Referring, further, to public opinion on this particular matter, I may say that, at the request of the Social Service Council of Canada, and with the permission of Hon. Dr. Roche, during November and December, I attended and spoke at meetings in Vancouver, Calgary, Regina, and Winnipeg, and at all of them, in the strongest resolutions possible, this very matter was dealt with. In the Social Service Report of two years ago resolutions adopted will be found dealing specifically with the matter, and urging just what has been so well set out in the papers that have been read before us to-day.

There is only one other matter I wish to refer to. In spite of the opposition of many prominent men, some, I was sorry to see, members of the British Medical Council, the British Government has now passed official regulations dealing specifically with venereal diseases. This has been taken care of under the Local Government Board in England, and, logically, in Canada we should have a similar board, namely, a Dominion Board of Health. The English regulations set forth that every county in England, through its county health officer or Board of Health, must make provision for the notification of all cases of venereal disease to the borough health officer or the city health officer, whichever it may be; that they shall arrange with all the hospitals within the county for the diagnosis and treatment of venereal diseases; that they shall establish what one might call clinics, where medical men shall perform the work required for the cure of the disease; that the health officer shall be notified of all these cases, and, that where there are poor people, the local municipality or health authority is required to send and to pay even for the transportation of the patient to the nearest hospital for treatment. Then, definitely, the Government of Great Britain provides that seventy-five per cent of the total cost of this

whole new service is to be borne by the Central Government and twenty-five per cent by the municipalities, or, as we should say, the counties.

Referring now to what is possible in Canada. Over twenty years ago, the Ontario Board of Health urged that the unit of health organization in Ontario ought to be a county, or of several municipalities, as a riding of 25,000 people. We insisted that, if we were to develop public health in Ontario properly, we ought to have, over a given area, an all-time medical health officer. The health officer was to be a man skilled in bacteriology and chemistry, having a certificate in public health, to be free from local municipal politics, to have his laboratory, and to devote himself to the public health, giving all his time to the health of his district. We divided Ontario into about eighty districts. If we had all-time men with their laboratories in such districts in Ontario, we would be equipped not only for dealing with the enormously important work of the diagnosis and treatment of venereal diseases, but equally so for the treatment and handling of tuberculosis, since such officers of the municipalities ought naturally to be in charge of the sanatoria of the counties. Until we get clearly before us, first, that the Dominion Government has a part in this work, and that, in our provinces, there must be adequate areas wherein specialized and specially equipped health officers can do the work, we are, manifestly, unequipped to meet the enormous needs of the situation which has been set forth this morning. I do trust that now, six years after this Commission passed the resolution to which I referred, positive steps will be taken, now that we know the dangers, and the increasing dangers, from the soldiers coming back, and that a definite move to combat the evil will be made.

MR. SNOWBALL: I am sure the addresses we have heard this morning have opened up a subject that, to my mind, is really most astounding. To some extent I was prepared for this, owing to my connection with recruiting in New Brunswick. The commanding officer of the battallion raised in our locality suggested to our Town Council that he might require the use of our isolation hospital on account of venereal diseases prevailing in his regiment. Another thing that astonished me was the difficulty they had to get a male attendant who would accept the position, even under the supervision of doctors. That opened my eyes to some extent. A druggist of my acquaintance gave me some information on the matter. He said it was surprising, and that I would be astounded, if he were able to tell just what was taking place in the little town in which he carried on business, and the number of people coming privately

to ask for advice and treatment. So, as a layman, I was prepared, to some extent, for the papers we have heard this morning. However, as a commissioner and as a citizen of Canada, I feel that we cannot too energetically undertake measures to cope with such a disease as has been brought to our attention; and I am glad that the Commission of Conservation has seen fit to bring up what might be thought a delicate subject for discussion in such a free and open way as it has been.

It has occurred to me, as far as the soldiers are concerned, that any soldier returning to Canada in a diseased condition should be treated as any other soldier or man coming into this country with contagious disease; and, while it might not be stated publicly why he was detained, he should, if necessary, be detained long enough to eliminate any effects of the disease and any chance of its transmission. Care should be taken that the men who are sent broadcast over Canada, to their home towns, should be men who are pure and clean. I think that it would be a good preventive measure.

In connection with immigration, we should also deal with this disease in a similar way. If people wish to come in and be citizens of our country, it is not too much to ask that they produce certificates from their home physician, or that they be examined by physicians on arrival. It is difficult to deal with the general run of citizens, but it has occurred to me that it might be possible, in connection with the examination given to school children, to, in some way, ascertain the homes in which the disease exists, or, through the treatment of children who might be infected, stop the spread of the disease.

I am very much impressed with the danger from this disease. It is more insidious than even tuberculosis, and calls for firm handling by the Dominion Government, with the co-operation of all Provincial governments and the Boards of Health of the different localities.

MR. ELLWOOD WILSON: The close and intimate relation between the sale of liquor and the spread of the disease should not escape notice. The difficulty of keeping liquor out of provinces with local prohibition certainly would seem to come within the scope of the activities of this Commission.

DR. ROBERTSON: I wish to express, first of all, my appreciation as a member of the Commission, of the service that has been given to the Commission and to the country through this admirably clear and complete statement of the facts of the case. This is an appropriate subject for us to consider—for the conservation of our resources. There is no resource in Canada comparable with that

of the good health, the good character, and the ability of our people. It is quite appropriate for this Commission to deal with it; and it should deal with it in the wisest possible way.

Having expressed very briefly my appreciation of the service given to the Commission and to the country by these talented gentlemen this morning, I suggest that they render a still further service. The situation which they have laid before us has been a very grave menace in Canada in the past, because of our way of managing things and leaving things unmanaged. The subject is full of difficulties. That is no reason why it should not be dealt with. That is a reason why it should be tackled in the wisest way. Many of us who have not studied this matter fully do not know the wisest way to proceed. Two things I would suggest: I would like to see a declaratory resolution, framed in fitting words with suitable substance, adopted by this Commission. That should be done, if only for its educational value. I would like to see a further step taken. When any approach is made to Parliament for new legislation every possible objection to its form, if not to its object, is raised or rises up of itself. I am quite free to speak, from my knowledge of politics during thirty years' connection with them, although I was not in them. The early objections and opposing arguments to even the best of proposals are like things that creep up into existence out of nothing. But they take semblance to substance in the mind of the politician, and even of the statesman. That being the case, if some committee—and the gentlemen who presented this matter to us seem admirably fitted for the task, perhaps assisted by some members of the Commission—would make a draft of a Bill embodying the necessary and suitable legislation, in terms that would meet the conditions imposed by the British North America Act, and, at the same time, be in line with the practice, as far as we have gone, in getting co-operation between the Federal and Provincial authorities, that would perhaps be the most effective next step that could be taken. I should like to see a resolution adopted or endorsed by the Commission, with an appendix of a suitable Bill or Bills for both the Dominion Parliament and the Provincial legislatures, if action by both authorities be necessary. That would help us perhaps more than any discussion in abstract and general terms.

Having known something of the methods of recruiting in Canada, and the results of recruiting, and having had a chance of seeing many thousands of our troops both in England and in France, I concur in what Dr. Adami has said indicating that the gravity of the situation in Canada at present is not due to the behaviour

of our men abroad. To be thoroughly fair and conscientious, one must say that we have rather aggravated conditions in England by allowing men to go there in an infected condition.

I feel that I should say, in justice to our men over there, that I do not believe they are going to be blamed, that they will deserve to be blamed, for the very grave condition that exists in Canada. It is very serious and nothing should be left undone that will remove or abate its evils.

If these two steps are taken, they would help to make real progress. If the Dominion Government has not power under the British North America Act, surely the preservation of the health and character of our people is sufficient reason for the Government to take the matter up with the Provincial authorities. There is no fear that the public would demur; they prefer a judicial error on the side of sanity and safety, even if the Federal authority should exceed its jurisdiction under the terms of the British North America Act, than that nothing adequate and effective should be done to lessen this national menace and evil.

SENATOR EDWARDS: We may remove from our minds any doubt on the question of the responsibility of the Dominion Government in the premises. The suggestion of Dr. Robertson is an admirable one and should be carried out. Unfortunately, the Chairman of our Committee on Public Health, Sir Edmund Osler, is not here, but some of the members of the Committee are present, and I would suggest that the medical gentlemen who have so admirably placed this subject before this Commission join this Committee as soon as we rise, and draft a resolution to put before this meeting, that it may be adopted by the Commission; we would thus be further indebted to them.

DR. ROBERTSON: One word more: One other reason why there may seem to be an absence of persons qualified to deal with this matter is that the Medical Adviser of the Commission, Dr. Hodgetts, who would have taken this in hand and co-operated with these medical gentlemen, has been absent for about two years as Canadian Red Cross Commissioner overseas. That is why we have no one here quite competent to co-operate with them in the name of the Commission.

Our Water-Powers and Industrial Development

BY

LEO G. DENIS

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OUR water-powers and the part they will play in the readjustment of industrial conditions suggest various questions of vital importance to Canada. It would be presumptuous, at this stage, to predict their solution, or even to point to any definite course which should be followed; consequently the writer has confined himself to pointing out some of the principal steps required to secure the maximum of result, and to emphasizing the necessity for immediate action.

We must be
Less Wasteful

The war has awakened Canadians to a realization of the natural resources of their country. It has thrown us back upon ourselves in a way which perhaps no other one thing could possibly have done. It has shown us we must be less wasteful in the use of our resources and must devote more attention to their more adequate development.

If we are to retain our place industrially, we must learn to do for ourselves what others have been doing for us. The time has surely arrived when we should work out our industrial independence and prepare for the industrial struggle that must follow the war, otherwise, it is more than likely we will lapse into our old helpless dependence and never realize our destiny of becoming a really great industrial nation.

It is impossible to state the definite total water-power potentiality for Canada. There are so many factors, such as allowance and facilities for artificial storage, or the adaptability of industries to seasonal fluctuation in the flow of streams. Various estimates for the Dominion have been made but all are of the nature of glorified guesses. One of the most recent estimates gives 25,000,000 h.p. as the total available water-power in Canada; another places the make-up total, exclusive of the North-west Territories, Yukon and Northern Quebec, at 17,746,000 h.p., not assuming the use of full storage possibilities; while a third estimate gives a total of over 13,000,000 h.p. for the three provinces of Ontario, Quebec and British Columbia alone.

Undeveloped
Water-powers

Although the representative total for the whole of Canada is more or less uncertain, fairly definite figures are obtainable for numerous water-powers, which are, as yet, undeveloped, particularly those in the more settled southern portion of the Dominion.

The importance of our water powers is shown in the rapidly increasing rate at which they are being utilized. As early as 1851, official records show 3,550 grist and sawmills operated by water-power in Upper Canada and Lower Canada alone. It is estimated that, in 1901, water-power utilized in the various industries for the entire Dominion amounted to 350,000 h.p., while, in 1911, a careful survey, made by the Commission of Conservation, revealed a total of 1,016,500 h.p. Estimates for 1915 show some 1,700,000 h.p. in use, and it may be taken for granted that the 2,000,000 horse-power mark has by now been reached.

Water-power
versus
Steam-power

In quoting figures on our utilized water-powers, it is customary to compare them with the cost of an equivalent amount of power produced from coal. This does not do full justice to our water-power, as many of the industries using it could not operate if compelled to use steam-generated power, while possibly the greater portion of those remaining would use imported coal, thus transferring to other countries the money value of the fuel used for power, which latter now remains in Canada.

The extent to which future utilization of our water-powers will enter into the industrial development of Canada will be measured by the energy and foresight of the various Governments, particularly the Federal authorities. In the past, we have relied too much upon the experience and investigations of other countries, trying, with more or less success, to adapt them to our conditions. In many cases, investigation work in connection with our water-powers and their utilization has been left to private interests; this has resulted in the acquirement by interested parties of a better knowledge of conditions than is available to those appointed to administer them for the public. Government engineers have often been handicapped by the lack of previous government investigation, as opposed to the thorough knowledge acquired by the engineers of parties interested in a proposed water-power project.

Systematic
Water-power
Investigations

The importance and necessity of further extending the systematic water-power investigations already initiated is fully realized. In organizing this work of investigation and research it will, no doubt, be under direct

government control and guidance, but the splendid facilities offered by the laboratories of our universities and other institutions must also be utilized. The award of scholarships for research work on water-power development and industrial utilization would result in further valuable information.

The director of the research laboratory of one of the largest manufacturing of electrical apparatus in the United States recently stated that, after the war, in many countries, a much more methodical and extended interest in, and support of, research will probably be found than existed before. The war has awakened renewed activity in the British Empire and elsewhere. The British Board of Education is putting forth a "Scheme for the organization and development of scientific and industrial research," through a committee of the Privy Council and an advisory council, the latter to advise the committee of the council on

- (1) Proposals for instituting specific researches.
- (2) Proposals for establishing or developing special institutions or departments of existing institutions for the scientific study of problems affecting particular industries and trades.
- (3) The establishment and award of research studentships and fellowships.

Australia also proposes to establish an Institute of Science and Industries whose functions are:

- (1) To consider and initiate scientific researches in connection with, or for, the promotion of primary or secondary industries in the Commonwealth.
- (2) The collection of industrial scientific information and the formation of a bureau for its dissemination amongst those engaged in industry.
- (3) The establishment of national laboratories.
- (4) The general control and administration of such laboratories when established.
- (5) To promote the immediate utilization of existing institutions, whether federal or state, for the purposes of industrial scientific research.
- (6) To make recommendations from time to time for the establishment or development of special institutions or departments of existing institutions for the scientific study of problems affecting particular industries and trades.
- (7) The establishment and award of industrial research, studentships and fellowships, to include either travelling fellowships or fellowships attached to particular institutions.
- (8) To direct attention to any new industries which might be profitably established in the Commonwealth.

(9) To keep in close touch with, and seek the aid of, all Commonwealth and state government departments, learned and professional societies, and private enterprises concerned with, or interested in, scientific industrial research.

(10) The co-ordination and direction of scientific investigation and of research and experimental work with a view to the prevention of undesirable overlapping of effort.

(11) To advise the several authorities as to the steps which should be taken for increasing the supply of workers competent to undertake scientific research.

(12) To recommend grants by the commonwealth Government in aid of pure scientific research in existing institutions.

(13) To seek from time to time the co-operation of the educational authorities and scientific societies in the states with a view of advancing the teaching of science in schools, technical colleges and universities, where its teaching is determined upon by those authorities.

(14) To report annually and from time to time to Parliament.

**Government
Action re
Research**

The Japanese Government has, during the past year, appropriated for a laboratory for physical and chemical research \$1,000,000, to which the Emperor has added \$500,000. The Canadian Government has recently created an Advisory Council on Industrial and Scientific Research. Water-powers and their allied industries will, no doubt, be given the attention they deserve.

Water-power investigations may be divided into two classes, differentiated, in general, under the following heads:

(1) The conversion of water-power to hydro-electric or other energy.

(2) The use or application of the converted energy to the best advantage under local conditions.

Under the first of these would come reconnaissance surveys, records of stream flow, evaporation, precipitation, and other climatic observations. Results of surveys and other information regarding undeveloped sites should be made available to the prospective power user. Recording the flow of streams should be extended to all rivers of importance, particularly those on which large water powers might be developed. These records, when covering a period of seven years or more, are most essential in establishing the value and capacity of any water-power; without them, no competent engineer could recommend any expenditure of capital on an installation to develop the maximum power during the low-water season or at other times. Detailed surveys of advantageous power sites, with designs for development projects, should also be included,

together with estimated cost of works, installation and operation. Studies of storage and other conservation possibilities should offer a wide field. Most of our streams are characterized by a large seasonal variation of flow and the capacity of a development is often economically limited by the minimum flow; unless storage and artificial regulation of the flow is resorted to, water runs to waste during the greater portion of the year. Artificial storage of water is already provided in several of the provinces, but it should be extended.

Problems Peculiar to Canada The solution of problems peculiar to Canada should be given attention. One of these is the conveying of the stored water to the point where it is to be used. During the winter season, the formation of ice and other difficulties resulting from low temperature are met with.

Testing and reporting on various classes of hydraulic and generating machinery and auxiliary apparatus, such as governors, regulators, etc., might also come under this head.

While many British Columbia water-powers offer natural high heads, those in the other provinces have, usually, relatively low heads, therefore, research conducive to reduction in cost of low-head developments would benefit Canada.

Irrigation and Water-power The relation between irrigation and water-power development in the western 'dry belt' offers conditions dissimilar to those of other countries; these require special investigation. In the United States, an important use of hydro-electric energy is in pumping water for irrigation purposes, and, while this may never become of great interest to Canada, we may anticipate the construction of joint undertakings using the same site and the same works intermittently for irrigation and water-power purposes. Water, which would be used for irrigation only at the periodical recurrence of a dry year, can be utilized for water-power purposes at other times. This is demonstrated by crop results of 1914 and 1915 from the same semi-arid area in western Canada. The failure of 1914 was changed to a bountiful harvest in the next year, by about eight inches more rainfall in the growing season.

Disposal of Water-powers The legal aspect of the disposal of our water-powers is important. The general principles incorporated in our legislation have now become fairly uniform in the different provinces, including the leasing instead of disposition of water-power rights in fee, their development and utilization within a reasonable period, and remuneration to the Crown, which latter, however, should not be a principal object in disposing of

water-power. These are all sound principles, and should be maintained, but the details should, if necessary, be changed to secure better results. In the eastern provinces, particularly, most of the water-powers in the settled portions have passed to private ownership; many of them are lying idle and are held by the owners for speculative purposes, or to avert competition. Owners on one side of the river have sometimes been prevented from developing by owners of the portion of the fall on the other side of mid-channel. This condition should be remedied, as water-powers in the more settled portions should naturally be harnessed first for the benefit of industries. Steps should be taken to release water-powers owned by parties having no intention of developing.

Canada's share in all boundary water-powers should be assured. These occur in the more thickly populated and settled portions and are essential to industrial development. They should be fully investigated and definite projects and detailed plans of construction for their development approved. These plans should then be strictly adhered to by prospective users, which would not only assure its proper share to each country, but, particularly, where several concentration sites are possible on the same river, co-ordination and non-interference would be secured. Large enterprises at Niagara, endeavouring to develop additional power, have again directed attention to boundary waters. In every case of original or additional boundary water-power development, Canada's share should be safeguarded before the plans are given approval; otherwise this country might lose, probably for ever, a portion of natural power facilities.

Application of
Electric
Energy

The investigations under the second head relate to the application of the energy derived from our water-powers to an economic end, for the benefit of Canada. While intimately connected with the first, this phase is of even greater moment—the most elaborate system of water-power development would prove valueless if not extended to yield a marketable product. Numerous problems, however, will arise, particularly in connection with the intermittent use of power as applicable to certain industries. This is well illustrated by a hydro-electric plant near Duluth, Minn., where fully one-half of the energy generated is delivered to a single electro-chemical works. Under arrangements to use intermittent power, practically all surplus energy is utilized, resulting in a load factor of about 90 per cent. The chemical company is notified as to the available power and adjusts its furnaces accordingly, thus securing the advantage of a cheap and plentiful supply.

Electro-chemistry and Metallurgy

The use of hydro-electric energy in electro-chemical and metallurgical processes is generally considered the most advantageous use of water-power. These industries, however, comprise many branches, each offering many different processes, and it is essential, through investigation, to ascertain which of these would be of greatest benefit to Canadian conditions. If known processes are unsuitable, investigation and research should reveal others which will be profitable to this country.

While local conditions may point to the direct application of water power, such as in the wood-pulp, paper and lumber industries, the use of electricity as a medium should produce the greater development. The intimate connection between the harnessing of streams and the production of electric energy is recognized, and, if the latter is included in our field, as it should be, we have almost unlimited possibilities. Electricity is one of the greatest potent factors of the universe: First, in its distribution, far and near, for the benefit of domestic life, but, perhaps even more so, in its various industrial applications, whether to produce light, motion, chemical action, or various degrees of heat.

Hydro-electric Development

Canada is by no means backward in hydro-electric development. With but few exceptions, all our principal cities and by far the greater number of our towns and villages are supplied with hydro-electric energy, while the electro-chemical industries centred at Niagara, Shawinigan and elsewhere evidence the development in that direction. Nevertheless, with proper direction and encouragement this could be greatly increased. An example of this is given in the electro-chemical field, where, although exact figures are not available, it is safe to say that more hydro-electric energy is exported for this industry than is used in Canada for the same purpose.

Control of Power Export

The question of power export has become very acute, and no export licenses should be granted except when unavoidable. Canada secures little benefit from this exported power, as, once a plant is in operation, the benefit derived from an installation generating the enormous quantity of 100,000 or 200,000 h. p.—exclusive of the small taxation and export charges—would be represented by the earnings of a staff of a dozen attendants.

Industries in which the cost of power is but a small factor in the total cost of production do not benefit greatly from cheap power. While cheap power is an attraction to all industries, other things being equal, those requiring the largest amount, figured on a basis of the value of their product, will naturally be more interested.

Power-using
Industries

The following table, prepared from both Canadian and United States census reports and various other sources, is of interest in this connection. It shows the amount of power required, in the industries enumerated, to produce \$1,000 worth of product during one year. The larger this amount, the greater need of cheap power for the industry.

Industry	H. P. required for every \$1,000 produced per year
*Mechanical wood pulp.....	16.93
*Aluminum.....	16.00
*Calcium carbide.....	15.39
†Cement.....	7.08
†Log products.....	2.95
†Brick, tile and pottery.....	2.28
†Iron and steel products.....	1.98
†Cottons.....	1.97
†Cement.....	5.91
†Paper and wood pulp.....	4.87
†Kaolin and ground earth.....	4.47
†Brick and tile.....	3.67
†Flax and hemp, dressed.....	2.46
†Lumber products.....	2.46
†Cottons.....	2.07

* Data from various sources

† Data from Canadian census

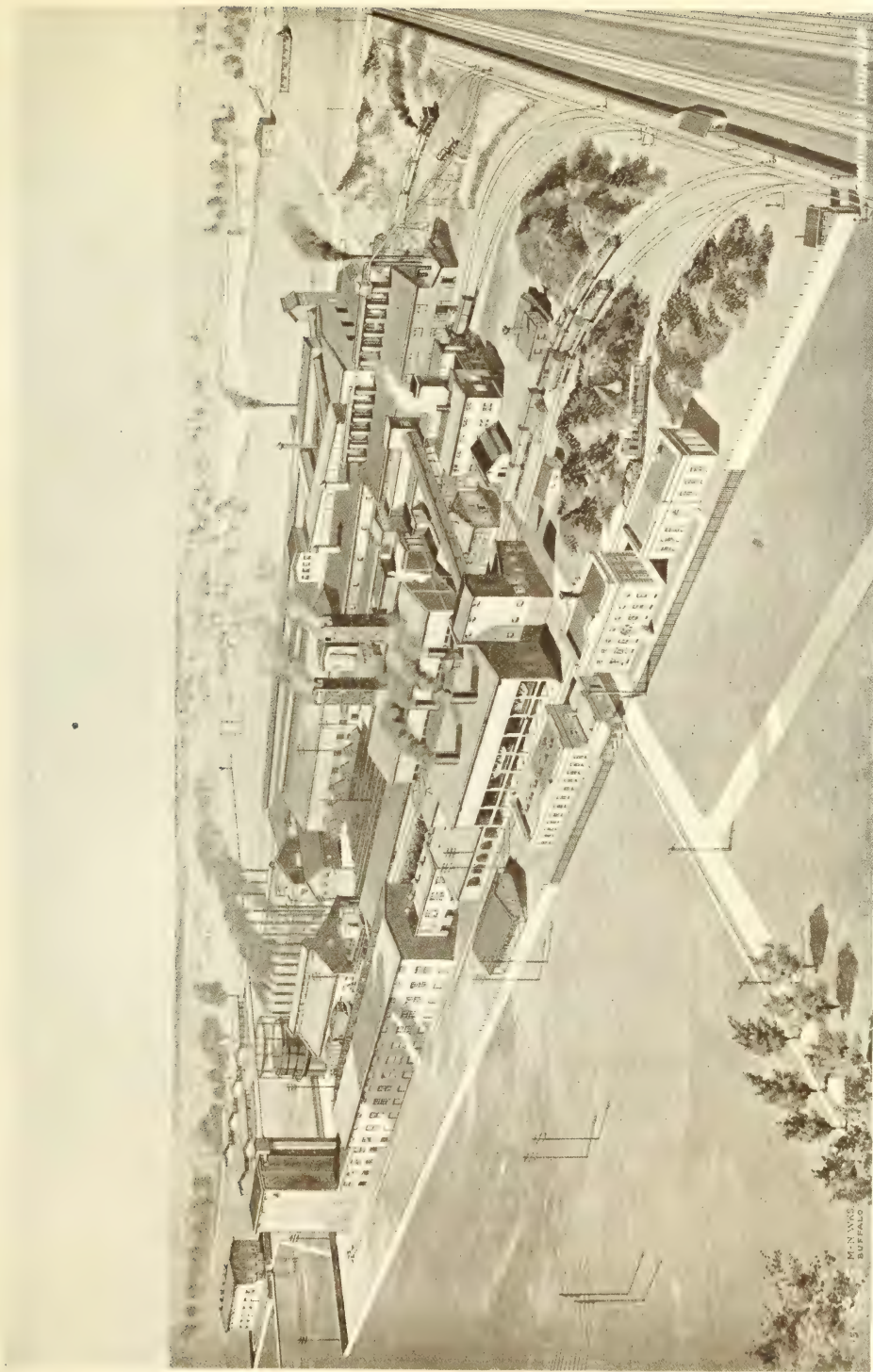
‡ Data from U. S. census

The manufacturer of carborundum, of nitric acid, of nitrate fertilizers from the nitrogen of the air, and of graphite in electric furnaces, all require large amounts of power.

Recent papers, read before the American Institute of Electrical Engineers, and dealing with the connection between water-powers and various industries, point out that industrial processes founded upon electro-chemistry have a part in the manufacture of a very wide range of commercial products.

Electro-
chemical
Processes

Electro-chemical processes have entered into some phase, at least, of nearly every branch of our industrial life. From a small beginning in electroplating two generations ago, much the greater portion of the copper output of the world is now electrolytically refined; zinc and tin so refined are also in the market. Electrolytic refining increases the purity of the metal and also makes possible the recovery of the impurities as by-products, thus greatly cheapening the cost of refining.



PLANT OF THE AMERICAN CYANAMID CO., NIAGARA FALLS, ONT.

The only plant in North America in which the nitrogen is derived from the atmosphere. Above 30,000 h.p. of electrical energy is used. Yearly production is 64,000 tons of calcium cyanamide.

Electrolysis of common salt forms the basis of the electrolytic alkali industry, the products of which are caustic soda, the starting point for various chemical industries; metallic sodium, also used as a foundation for other products, such as the cyanide so largely used in the metallurgy of silver and gold, chlorates, used in the manufacture of matches, certain explosives, etc., hypochlorites, of value for bleaching, and chlorine, employed as a sterilizing agent.

Electric Furnace Products

Many new industries have been created by the electric furnace, some of the products of which are abrasives, graphite, silicon, ferro-alloys, refined steel, phosphorus, calcium carbide, used in the generation of acetylene, and in the manufacture of cyanamide; it is also being experimented with in the metallurgy of many metals. Used as an electrolytic furnace, it becomes an important application to the production of aluminum.

Electric furnace processes all consume large quantities of energy; an ordinary melting operation, such as casting an alloy or refining steel, usually requires from 600 to 1,000 k.w.h. per ton. In the production of ferro-alloys the power used varies from 3,000 to 8,000 k.w.h. per ton of product; the aluminum furnace requires 25,000 k.w.h. per ton of product.

The industrial use of electric discharges through gases is still in its infancy, but among the products are ozone and nitric acid, the former used for sterilization and the latter as a base for fertilizers and explosives.

Production of Nitrogen

The production of some of the most highly nitrogenous food products has been steadily declining and Canadian and United States farmers have been producing less per acre than European farmers. In the last analysis, the food supply depends upon the plant food supply. The production of nitrogen, which is one of the three principal fertilizer ingredients, is distinctly a water-power proposition, involving the fixation of atmospheric nitrogen.

Each of the processes under consideration has advantages. The problem is many sided and far reaching, and hence it is very desirable that the various government departments concerned should co-operate in determining the most advantageous.

Those not familiar with conditions in the electrochemical industry commonly put all electrochemical industries in one class as power consumers. They are, however, extremely diverse, their requirements in power, and the relative importance of the factors of power, labour and other items are also extremely diverse.

The electrochemical industries have already become of great value to Canada and, in the utilization of water-power resources, will become far more so; they have a fundamental interest in the development of cheap power, which can only be obtained by the harnessing of streams and they offer nearly ideal power loads of magnitude. In view of this it seems evident that organized research work to extend their present relatively limited field would prove of great benefit to the country.

Electricity as
Motive Power

While not so apparent, as in the case of the special processes using large quantities of electric energy, the latter plays an important part in many of our other industries. As a motive power it is easily applied and distributed, and, under certain conditions of operation, it is much cheaper than any other form of power. Its convenience and economy is well illustrated by the fact that, even where coal is used as a primary agent, innumerable cases are in evidence where conversion to electric energy is first resorted to, before application to the various contrivances to be operated. Electric energy used as a source of heat is also an important factor in the manufacture of many products, and some 35 or 40 industries use it extensively in such applications as electric welding, melting tanks, soldering devices, tempering baths, annealing furnaces, and various types of self-heated tools.

The necessity for government investigation, surveys and research work in connection with our water-powers and their industrial application was demonstrated in the recent controversy between United States government officials and the electrical corporation interests. One of the arguments advanced by the latter was that too much intrinsic value should not be given to latent water-powers, as enterprises connected with their development and utilization presented unusual risks, owing to the many unknown quantities involved. Let us then prepare to refute such arguments in Canada, by reducing these unknown quantities to a minimum. How much more valuable and attractive to capital would our water-powers be if we were able to say, not only that such a water-power will cost, approximately, so much to develop but to demonstrate that the energy derived therefrom may be utilized profitably in certain definite industries.

Report of Committee on Forests

BY

CLYDE LEAVITT

Chief Forester, Commission of Conservation

THE most striking feature in the forestry situation in Canada today is the extreme shortage of trained men available for the technical features of forest administration and research. The forestry profession, no less than others, has answered the call for overseas service. A very high percentage of the graduate foresters of the country are now engaged in Europe and a number have already given their lives in the defense of the Empire.

This profession was only beginning to get on its feet in Canada, and, thus far, had developed only a very small personnel in proportion to the actual needs of the country. The result of the heavy enlistment has been that the various forestry organizations have, as to supervisory staffs, been reduced practically to a skeleton basis, taxing to the utmost the efforts of the few remaining technical men to hold the ground already gained.

Similarly, as in other departments of university work, the forest schools have been so largely drained of undergraduates that, for years to come, the normal supply of graduates available to build up forestry organizations will be sufficient to supply only a fraction of the real need.

For some years, therefore, we may anticipate that, taking the country as a whole, material progress in forestry will be made with difficulty and only as a result of strong and well-planned effort. This is especially true as to research work, since, when an organization charged with routine administration becomes short-handed, the routine *must* receive attention. Unless a special organization exists for this purpose there is little opportunity for development along research lines. Obviously, then, if continued progress in forestry is to take place in proportion to the need, a very special and well-organized effort, supported strongly by appropriate governmental and private aid, must be made. This applies to research, as well as to additional facilities for the training of men, both of which points will be further discussed later in this report.

Notwithstanding the adverse general conditions, notable progress has been made during the past year, in several directions.

Developments in
New Brunswick

In New Brunswick a thorough forest survey of Crown lands has been commenced, and, during the past season, several parties have been in the field, under the direction of P. Z. Caverhill, a graduate of the forestry department of the University of New Brunswick, with, later, practical experience in the Dominion Forestry Branch and in the forest service of British Columbia. The work includes not only the mapping and cruising of Crown timber lands, and studies of rate of growth, but also a soil survey, calculated to facilitate the opening to settlement of lands chiefly valuable for that purpose, as well as the segregation for permanent forest production of lands not chiefly valuable for agriculture. Approximately 375,000 acres were covered during the season of 1916, out of a total of 7,750,000 acres of Crown lands. This project has cost approximately $4\frac{1}{2}$ cents per acre for field and office work and supervision, or a total of approximately \$16,000 for the season. The Commission of Conservation has maintained close touch with this project, and has co-operated to some extent, particularly in the preparation of plans for the field work.

The vast amount of detailed information collected will enable the Provincial Government to formulate an intelligent and far-sighted policy for the scientific handling of its Crown timber-lands, which now yield to the provincial treasury an annual revenue of more than \$500,000. The demand upon New Brunswick forests is heavy, and the fear has been expressed that the annual cut is more than the annual growth. The investigation now under way should answer this question definitely, and also indicate what measures are necessary to provide for the satisfactory reproduction of cut-over and burned-over areas and to bring the annual growth of timber up to a reasonable maximum.

The adoption of any such plan should logically be preceded by the consolidation, under one organization, with adequate technical staff, of all the different lines of forestry and fire-control work, now more or less scattered. In New Brunswick, as in all other provinces, the most urgent immediate problem is better fire protection, and to this the attention of the authorities is being given.

Situation in
Ontario

Notable progress is to be reported in connection with the fire-protection situation in Ontario. Partly as a result of inquiries previously initiated, and partly as a result of the great fire disaster of last summer in the 'clay belt,' a complete reorganization of the fire-ranging service has been announced. This work has been combined with the Forestry Branch, under E. J. Zavitz, Provincial Forester.

In reply to a deputation organized by the Canadian Forestry Association, in November last, the Minister of Lands, Forests and Mines, Hon. G. H. Ferguson, gave assurance that the situation would be fully met by the measures proposed to be adopted by the Government. These include adequate provision for overhead supervision and inspection of the fire-ranging staff, the adoption of the permit system for regulating settlers' clearing fires, and the construction of improvements, such as trails, telephone lines, lookout towers, etc. Plans for handling the work on these lines are now in course of preparation. The Minister of Lands, Forests and Mines is to be congratulated upon the action taken and proposed, which, without question, marks the beginning of a new era in forest protection in Ontario. The problems which will confront the new organization are very real, especially in the Clay Belt section, where the whole combination of conditions is radically different from that existing in other parts of the country. In building up the new organization, it is highly essential that the very best men available be secured to assist the Provincial Forester, both in the head office and in the field. On any other basis, the degree of success which may be anticipated will necessarily be limited. The full support of public sentiment will be needed to make this important work the full success that the true interests of the province demand.

In view of the success of co-operative fire protection in Quebec, between the Government, the limit-holders and the private owners, the Commission of Conservation offers the suggestion that the formation of similar associations be considered by the limit-holders and by the Government of Ontario.

**Forest
Protection
in Quebec**

During the past year, the situation in Quebec has been very materially improved through several amendments to the Forest Fires Act. Of these, the most important provides for lengthening the season during which permits are necessary for setting out clearing fires.

Taking the province as a whole, decidedly the best results have been secured in the territory of the St. Maurice and Lower Ottawa Forest Protective Associations, though excellent results have also been accomplished by some of the individual limit-holders outside of this territory.

The St. Maurice Association, protecting an area of more than 7,000,000 acres, has come through the season with a total burned area of 450 acres of merchantable timber, 2,376 acres of young forest growth, and 8,000 acres of cut-over land and old burn, in all

about one-seventh of one per cent of the area patrolled. The Lower Ottawa Association, protecting an area of nearly 8,500,000 acres, had a total burned area of 8,727 acres, or but little more than one-tenth of one per cent. Of this, but a small percentage was commercial forest.

These most excellent results have been brought about by close organization, adequate overhead supervision and inspection, intelligent use of mechanical equipment, and the strict adoption of the merit system as the sole basis of appointments. These associations are maintained primarily by the limit-holders, though the Provincial Government closely co-operates, in addition to a contribution based on the protection of unlicensed Crown lands.

The undoubted success of co-operative forest protection will, it is hoped, result in the organization this winter of an association in the Quebec portion of the Upper Ottawa watershed. This action has been attempted during the past two or three years, but failed only because of the unconvinced attitude of a relatively small number of limit-holders.

Under the auspices of the Department of Lands and Forests, an attempt is also to be made to secure the organization of still other associations elsewhere in Quebec, and these efforts should, with the assured encouragement of the Provincial Government, prove entirely successful. The manager of the St. Maurice Forest Protective Association, Henry Sorgius, is to visit the limit-holders throughout the province, in connection with this project, and a convention is to be held in Montreal on February 1 and 2, for the consideration of problems connected with forest protection, under the auspices of the St. Maurice and Lower Ottawa Forest Protective Associations, assisted by the Provincial Government.

Forest protection has received the hearty sympathy of the provincial authorities. It is believed, however, that the importance of this work fully justifies, and in fact urgently requires, a greater degree of financial support from the provincial treasury. Under the present system, the attention paid to the protection of unlicensed lands is inadequate, and there is also much to be desired in the direction of better provision for supervision and inspection of fire-rangings on licensed lands outside the two associations. The situation urgently demands a much larger force of inspectors for licensed lands, an adequate staff for the protection of large areas of unlicensed lands, in order that they may remain, or become, productive, and a sufficient head-office staff to maintain proper control over the entire organization.

Nova Scotia There is no material change to report in the situation in Nova Scotia. This Commission has previously advocated the appointment of a technically trained forester, and this recommendation still stands.

The suggestion is made that the province embark upon a policy of re-acquiring cut-over and burned-over non-agricultural timber lands, to supplement the present small area of Crown lands. Thus, at relatively small expense, the province can gradually re-establish the basis for a comprehensive policy of forestry practice on Crown lands. The necessary legislation already exists; only the required appropriations are lacking.

British Columbia In British Columbia, the Forest Branch has been severely handicapped by the heavy enlistment of technical men and other experienced officials, as well as by the loss of two experienced foresters, who resigned to accept responsible positions in connection with the forest survey of Crown lands in New Brunswick, their native province. More recently, another forester has left the Forest Branch to become woods superintendent on the 2,000,000 acres of pulpwood lands in Newfoundland belonging to Lord Northcliffe. These facts are cited merely to show that there is a very real place for trained and experienced foresters in both governmental and private work, and this is becoming increasingly realized. The need for men trained in the theory and practice of forestry has become so urgent in the west that the University of British Columbia has decided to establish a forest school at Vancouver. This action is to be commended, and it is hoped that it may be made effective at an early date.

There is urgent need for the application of scientific research to the development of wider markets for the vast forest resources of British Columbia. This matter is discussed more fully in another portion of this report.

The Forest Branch has, through its own organization, made a remarkable showing in the development of new markets, both foreign and domestic, for British Columbia timber. This effort has been aided very materially by the work of H. R. MacMillan, as Dominion Timber Trade Commissioner, under the Department of Trade and Commerce. Mr. MacMillan spent more than a year touring the world, in the interest of greater foreign markets for Canadian forest products. The home market has also been materially extended, through the announced decision of the Canadian Government and the Canadian Pacific railway to use Canadian

timber wherever practicable. The definite adoption of this policy will be of especial value in providing an additional market for British Columbia fir in eastern construction work.

Dominion
Lands

As in the case of other organizations, the Dominion Forestry Branch has been seriously handicapped by heavy enlistments of trained and experienced men.

There is no change in the situation relative to placing the field organization of the Forestry Branch under Civil Service regulations. As has been brought out repeatedly in previous reports, action along this line is vitally important to the efficient handling of the work with which this branch is charged.

Progress has been made in the matter of brush disposal in connection with timber sales in forest reserves. This policy is becoming well established, and the beneficial results are apparent in the form of decreased fire hazard.

On the other hand, no progress can be reported in connection with the enforcement of the technical forestry regulations on licensed timber berths, these not being under the jurisdiction of the Forestry Branch. A large percentage of the merchantable timber on Dominion Crown lands is included within these licensed timber berths, and the fact that there is no provision for a technical administration of cutting regulations on these lands is a complete anomaly. Under the present plan of administration, the forestry experts of the Dominion government are completely cut off from any direct administrative contact with cutting operations on lands which contain the great bulk of merchantable timber on Dominion Crown lands.

No new forest reserves have been established since 1913, although a large area of Dominion Crown land has been found, upon examination, to be suitable for this purpose. Presumably the creation of new forest reserves is being postponed until after the war.

The Commission of Conservation and the Dominion Forestry Branch have co-operated in the examination of cordwood cutting operations on the Petawawa Military reserve, with a view to having these cutting operations handled on a scientific basis. It is to be hoped that such co-operation may be continued and extended, as to cutting on any areas within military reservations which are not needed for strictly military purposes.

The Department of Indian Affairs has made a notable advance by adopting the policy of requiring the disposal of logging slash in connection with timber sales on Indian reserves. This is no hardship from the point of view of the operator, since the cost of the work is taken into consideration in making the tenders for the timber.



A NEW SETTLEMENT ON GOOD AGRICULTURAL LAND IN NEW BRUNSWICK

Here the value of the land for farming predominates over the timber value.



A HOMESTEAD IN EASTERN CANADA

This was selected solely for the value of its timber. The soil is wholly unsuitable for farming purposes, and the place was abandoned after the timber was removed. It is contrary to all principles of public policy to permit such land to be homesteaded.

The Parks Branch makes no sales of green timber in Dominion parks, but it has made considerable progress in the disposal of debris from old slashings on timber berths. Material progress has also been made in better methods of fire prevention and control, particularly through the use of mechanical equipment, including a new design of pumping apparatus. It has also been active in propaganda work along the lines of advocating better methods of forest fire prevention.

Settlers' Permit System The permit system of regulating settlers' clearing fires has proved an unqualified success wherever it has been given a fair trial, with a competent and adequate staff for its enforcement. It is now in effect in British Columbia, Quebec, Nova Scotia, part of New Brunswick, and in Dominion forest reserves in the west. It seems assured also for a large area in Northern Ontario.

A movement is also on foot to make it effective as to forested lands outside the forest reserves, in the provinces of Alberta, Saskatchewan and Manitoba. The Minister of the Interior has approved of action which will make the permit system of regulating clearing fires applicable to forested lands upon which homestead entries may be made hereafter. Provincial legislation, however, is necessary to cover the situation as to lands which have been filed upon or patented in the past. The influence of the Commission of Conservation should be exerted in favour of such action.

The careless or reckless burning of settlers' slashings constitutes the greatest single menace to our forests today. This situation is entirely unnecessary, and should not be allowed to continue in any section of Canada where valuable forests are at stake. Experience proves it can be controlled at a reasonable cost without antagonizing more than a very small element of the local population, and that probably only temporarily. The St. Maurice Forest Protective Association found it necessary in 1913 to secure 51 convictions for setting out fires without a permit. In 1914, the number of such convictions was reduced to 42, in 1915 to 10, and, in 1916, to one. In all, some 1,213 permits were issued by this association during 1916, and, in this territory, not a single settler's fire was reported as escaping and causing damage. In Quebec as a whole, over 11,000 permits were issued during the past year, and not half a dozen of the slash fires got out of hand. Outside of the areas protected by the two co-operative associations, the enforcement of the permit law is in some sections only partially adequate, owing to insufficient staff.

In British Columbia, in 1915, more than 9,000 settlers' burning permits were issued by the Forest Branch. Beyond any question such regulation has proved effective to a very large degree.

Civil Service
Reform

It seems fitting to again emphasize a point that has been raised at nearly every annual meeting of this Commission, namely, that both efficiency and economy in the forestry and fire protection services of the Dominion and Provincial governments will best be subserved by definite legislative action placing field appointments in such organizations upon a Civil Service basis. Beyond question, such appointments on a patronage basis have, in the past, caused Canada the loss of many millions of dollars in timber unnecessarily destroyed by fire and in salaries of fire-ranging staffs which were only partially effective because the basis of selection was fundamentally wrong. The evils of this system have, in many cases, been freely admitted, but action to cure the situation has, unfortunately, been slow in coming. In view of the enormous war expenditures of Canada, it would seem that the country can ill afford longer to support this wasteful and inefficient method of making appointments to the public service.

It now appears that British Columbia is to be the leader in this reform. For some time, Dr. Shortt, of the Dominion Civil Service Commission, has been in that province, by request of the Provincial Government, for the purpose of making specific recommendations in connection with the entire situation.*

Railway Fire
Protection

The railway fire protection work, in the establishment and administration of which the Commission of Conservation has co-operated with the Dominion Railway Commission, has produced remarkably satisfactory results. Under the provisions of the Railway Act, and the regulations of the Board, the railways subject to its jurisdiction have assumed full responsibility for the extinguishing of fires presumably due to railway causes. Admirable co-operation has existed, for the most part, between the railway organizations and the several Dominion and Provincial fire-protective agencies, with results thoroughly satisfactory to all concerned. Railway fires have been reduced to a minimum, and the railways have also rendered signal service in the

*British Columbia has since appointed two Forest Protection Boards, one for the Coast district and another for east of the Coast range. In each case they will consist of the Deputy Minister of Lands, Forests and Mines, the Chief Forester, the Assistant Forester in charge of fire prevention, and two lumbermen representing the district. The Board will hold examinations, make appointments and exercise general supervision over provincial fire protection.

extinguishing of many fires, for the origin of which they were in no wise responsible.

In forest sections, 558 fires are reported as originating within 300 feet of lines subject to the Railway Commission's jurisdiction, being 128 fires less than in 1915. Of these, 69 per cent are definitely attributed to railway causes, 18 per cent to known causes other than railways, and 13 per cent to unknown causes. Of the 388 fires chargeable to railway causes, 101 fires, or 26 per cent, were incipient fires which did no damage; 287 fires, or 74 per cent, were larger fires, which burned over 11,290 acres, valued at \$35,566. The total damage from all fires is estimated at \$39,481. Of this the railways are charged with 90 per cent, known causes other than railway fires 8 per cent, and unknown fires 2 per cent. Thus, on all lines subject to the jurisdiction of the Board throughout Canada, the fires in forest sections definitely attributable to railway agencies did damage amounting to only \$35,567—a remarkably good showing, considering the unfavourable weather conditions.

The causes of fires reported were as follows: Locomotives, 61 per cent; railway employees, 8 per cent; campers and travellers, 7 per cent; settlers, 8 per cent; other known causes, 3 per cent; unknown causes, 13 per cent.

Tank cars for fire fighting are now used on the Canadian Pacific, Grand Trunk, Timiskaming and Northern Ontario, and Canadian Government railways. They have proved effective and wider use is hoped for.

The fire protection situation on Canadian Government railways has somewhat improved, largely through closer co-operation with provincial agencies. For 1917, an arrangement has been completed, under which the St. Maurice Forest Protective Association will maintain a patrol between Parent and the Ontario boundary, in co-operation with the Quebec Government and the Government Railways management.

The far-sightedness of some of the larger pulp and paper companies has resulted in a great impetus to forest planting, especially in the province of Quebec. Extensive programmes of forest planting have been adopted by the Laurentide Co., Riordon Co. and Pejepsco Pulp and Paper Co., each of which employs a trained forester in connection with this and other work. The exhaustion of pulpwood supplies in many parts of the United States and the diminution of the more accessible supplies in portions of Canada, with consequent heavy increases in the cost of pulpwood, are responsible for this changed point of view, which is of great promise for the future.

Forest Planting

The Canadian Pacific railway has extended to eastern lines the policy previously in effect in the west, of planting trees at selected points along their lines, as windbreaks and snow fences.

White Pine Blister Disease The attention of the Commission of Conservation has been directed toward the menace to the young and mature white pine in Eastern Canada by the pine blister disease. This is a fungus disease, which was originally imported on infected white pine nursery stock from Europe. As it attacks only the five-needle pines, the red pine, jack pine, lodgepole pine, and others pines are immune.

This disease has already acquired a strong foothold in the New England States where serious outbreaks have been found at hundreds of points east of the Hudson river, the situation being especially bad in Massachusetts. Lesser outbreaks have been discovered in most of the States in the white pine region as far west as Minnesota.

In Ontario, there is a serious infection in the Niagara peninsula, to which the attention of the Provincial Government has been vigorously directed during the past year, in co-operation with the office of the Dominion Botanist. Strong effort must be made and continued for years, to prevent the spread of the disease into the great pineries of the province.

In Quebec, small infections have been found at Oka and Ste. Anne-de-Bellevue. Infections have been found in Northern New Hampshire, and also one in Vermont, within one and a half miles of the Quebec boundary. It is quite possible, therefore, that there may be additional outbreaks in the province of Quebec. No infections have yet been found in New Brunswick, but the pines there may, later, be threatened by the spread of known outbreaks in Maine. No general survey of the situation in Quebec has yet been undertaken, but the Minister of Lands and Forests has given assurance that it will be fully investigated during the coming year, and vigorous action will be taken to prevent the spread of the disease and to eradicate any infections discovered. In this work, particularly the preliminary scouting to discover infections, the Dominion Government should co-operate fully. In the United States, the Federal Government is spending practically dollar for dollar with the States.

In Holland, Denmark, England and in certain other portions of Europe, the existence of the pine blister disease has rendered it practically out of the question to grow white pine commercially. The existence of large areas of white pine on this continent is threatened. Eradication of the disease in large areas of New England is now believed by good authority to be impracticable, but there

is still hope that it can be controlled and the spread prevented. There is still time to save the situation in Canada, but really vigorous action is immediately imperative. The chestnut blight, another imported disease, has already destroyed nearly all the chestnut in the United States, and now white pine is seriously threatened with a similar disaster. Our Eastern Canadian white pine is probably valued at upwards of \$200,000,000. The preservation of this enormous resource demands the immediate adoption of thoroughly adequate measures by both Dominion and Provincial governments. There should also be close co-operation with the various State and Federal agencies engaged in this work to the south of us.

There are about 2,700 million feet of western white pine in Southern British Columbia, the existence of which would be threatened should this disease obtain a foothold in the west.

The pine blister disease is especially dangerous to young trees; its serious spread would therefore tend largely to eliminate the immensely valuable white pine from forestry calculations for the future. Since this disease has, as its alternate host, the gooseberry and currant bushes, it must be attacked from this standpoint as well. Not only is there the most urgent need for vigorous action by the respective provinces, but the Department of Agriculture should also co-operate in the scouting for infections, as well as continue the research work now under way.

**Investigation
of Forest
Resources**

One of the most important lines of work to which the Committee on Forests has committed the Commission is the inventory of forest resources of Canada.

As a result of field work, which has been under way during the greater part of the past four years, data have been collected by R. D. Craig and Dr. H. N. Whitford, as to the forest resources of British Columbia and by J. C. Blumer as to Saskatchewan. The reports are now in process of compilation and will be published as early as possible during the coming year. The reports will be authoritative, and will be of great value to the many interests concerned with the exploitation and utilization of the forests of Canada. The securing of this data by the Commission would have been impossible, but for the admirable co-operation of the Dominion and Provincial forest services, limit-holders, private landowners, explorers, etc.

The British Columbia investigation shows that out of a total area of 250,000,000 acres, there is 150,000,000 acres which, on account of altitude or soil conditions, is not capable of producing forests of commercial value. Of the remaining 100,000,000 acres

which may be considered as potential forest land, 8,000,000 acres is considered to be of greater value for agricultural purposes, reducing the absolute forest land of commercial value to 92,000,000 acres, only some 33,000,000 acres of which carries merchantable timber at the present time. The remainder has been burned over and is now more or less restocked with young growth. The timber uselessly destroyed by fire is equal to about twice the amount now standing. About three-quarters of the potential forest area has been at one time or another burned over. If preserved, the young forest growth on this land will, in the course of time, add enormously to the wealth of the province and of the Dominion. Our investigation shows that the total present stand is approximately 350,000 million feet of saw material, two-thirds of which is on the coast and one-third in the interior. In addition, there is a large quantity of smaller material suitable for piles, poles, pulpwood and shingle bolts, which will doubtless bring the total stand to at least 360,000 million feet. This is probably about half the total stand of saw timber in Canada.

An investigation of the forest resources of Ontario will be begun by Mr. Craig at an early date. Assurances have been received that, in this important work, the Commission of Conservation will have the hearty co-operation of the Provincial Department of Lands, Forests and Mines. In connection with this study, it is proposed to commence with the investigation of pulpwood resources. This is particularly opportune and of urgent importance, owing to the rapidly increasing demands upon the pulpwood forests of Canada, for both home and foreign consumption. The price of newsprint paper has increased more than fifty per cent within a very short time. It is estimated that the available pulpwood resources of the North-eastern States will suffice for only about 14 years' supply, at the present rate of cutting. United States pulp and paper mills are forced to depend, to a constantly increasing extent, upon Canadian supplies; more than half the pulpwood used in the United States coming from this country. There is also a very strong tendency toward the establishment of new pulp and paper mills in Canada, as well as the enlargement of existing ones. Nothing seems more certain than that the drain upon our pulpwood forests will increase very rapidly, with the resulting investment of large amounts of capital in Canada, the employment of thousands of labourers, both skilled and unskilled, and the consequent stimulation of business of all kinds.

It is evident that Canada is to become one of the world's greatest sources for the supply of pulp and paper. The time has passed when intelligent men speak of "inexhaustible" virgin forest resources,

but it is only now being realized that these resources may be *made* inexhaustible if the cutting is done in such a way that reproduction will be secured, and if destruction by fire be prevented.

In view of the certainty of a vastly increased demand upon our forests, especially for pulpwood, we should know with some accuracy the extent of these forests, and the character and amount of supplies of various kinds which they contain. To secure such information for Ontario will be the immediate object of the proposed investigation.

Forest Research

The developments of the war have impressed upon the public the vital importance of the basic industries in any intelligent plan of preparedness for either war or peace. The necessity for close co-operation between science and industry has become recognized as never before.

The development and perpetuation of the basic industries necessarily implies not only far-reaching plans for the conservation of the materials upon which these industries are based, but also the conduct of scientific research, in order that new uses and the most efficient methods of utilization may be determined.

The raising in Canada of several so-called Forestry battalions, for the cutting of timber overseas, emphasizes the vital importance of forest resources in connection with war operations. In Canada, it must be recognized that, on either a war or peace basis, the lumbering and pulpwood industries are essentially basic industries, that, upon them, depends a host of secondary industries of vital importance in the economic life of the country, and that the best utilization of the forest resources, including the development of new uses and new markets, both domestic and foreign, still offers a wide field for industrial research. It is perfectly reasonable to expect that we should be able to increase the intelligent use of wood by learning more about its qualities. This in turn means more and better business for Canada, which means an increased capacity, from both direct and indirect revenues, for the payment of the great war debt with which the country will be confronted.

In connection with such investigations, a most excellent beginning has been made by the Forest Products Laboratories, maintained by the Dominion Forestry Branch in co-operation with McGill University, at Montreal. Particularly valuable are the investigations in pulp and paper manufacture, which promise results most important to the industry.

The situation in British Columbia appears to call for special consideration. That province contains approximately one-half the saw timber of Canada. It is estimated that the annual cut could be increased five times without impairing the productive capacity

of the soil or infringing upon the capital stock. If this enormous potential wealth is to be realized upon, it is perfectly obvious that a large export trade must be developed, since it could not possibly be absorbed by the local market. The development of such an export trade will require not only adequate shipping transportation and improved selling organization, but a considerable amount of research as well, in order to determine scientifically the specific qualities of the forest products of the Pacific coast, so that prospective purchasers may be supplied with concrete information as to the adaptability, in regard to strength and durability, of these products for the special demands which have heretofore been filled by woods from other sources. It is of the first importance, also, that full information be available as to the best methods of manufacture for the various purposes. Further, it is essential, in order to cultivate a market satisfactorily, that grading rules for lumber, based on scientific research, be formulated, as is being done in the United States.

As an example of the opportunities which exist, H. R. MacMillan reports that a vast market exists in India for railway ties, for which our Douglas fir is believed to be admirably adapted, provided suitable material is selected and the proper methods of preservative treatment are followed. Offers of co-operation have been made by the management of the Indian railways which, if accepted, would undoubtedly lead to a large trade in this one line alone. In this case, research is urgently required to determine the methods of preservative treatment best adapted to the special requirements of the particular situation.

Unbelievable ignorance of the physical qualities of Douglas fir exists in most of the foreign markets, and this results in limiting the use of this wood, especially in South Africa and Australia, to the cheapest and most temporary construction. In the absence of official data to the contrary, the prejudices in favour of woods to which the dealers are accustomed can be overcome only with great difficulty.

There are many other cases where scientific research may pave the way for vastly increased markets for Canada's surplus forest products. In addition to such opportunities, there may be mentioned the need for research to determine methods for the better utilization of wood waste. Under present conditions, only about one-third of the solid contents of the tree is utilized in the form of lumber, the balance largely going to waste in the form of sawdust, slabs, edgings, tops and stumps. Ultimately, it should be possible, with proper methods, to use to advantage at least a considerable propor-



BRUSH PILED READY FOR BURNING

A timber sale area in the Duck Mountain Forest Reserve, Manitoba.



AN AREA IN A DOMINION FOREST RESERVE

The logging slash has been piled and burned, thus greatly reducing the fire hazard. Brush disposal regulations apply on timber sales on forest reserves, but are not enforced in connection with lumbering on licensed timber berths.

tion of this waste material. This general situation indicates the advisability of establishing a forest products laboratory at Vancouver,

The problems above discussed relate to the utilization of resources already existing. It is understood that the Research Advisory Council will be concerned, as well, with the advancement of investigations looking toward the scientific reproduction of our living natural resources, including the forests.

In this connection, the hope is expressed by the Committee on Forests that arrangements can be made by the Commission of Conservation, during 1917, for commencing an investigation of what technical measures are necessary to ensure the perpetuation of the vast pulpwood forests of Eastern Canada. The importance of these forests in the economic life of the country has been emphasized in connection with the discussion of the proposed investigation of the forest resources of Ontario. The supplementary investigation here proposed would involve a study of the effect of present methods of cutting upon the character of the forest, the amount and kind of natural reproduction, the rate of growth which is taking place, and the effect of forest fires upon the future of the forest. There is a great difference of opinion as to whether, under present methods, cut-over lands are reproducing the valuable species in potentially commercial quantities. It is of the highest importance that this question be fully investigated. This investigation should be of a thoroughly practical character, with definite conclusions as to what measures are necessary to place the pulpwood forests of Eastern Canada upon a permanently productive basis. Only too generally has the forest been treated as a mine of inexhaustible resources, rather than as a crop which may be reproduced time after time upon the same soil.

It is recommended that this project be definitely approved by the Commission, for the season of 1917. Excellent co-operation, for at least this season's work, has been assured, and the cost to the Commission for 1917 need not exceed about \$2,500. This, of course, will constitute only a beginning so far as the general situation is concerned. The matter of continuation and extension during succeeding years should be taken up with the Research Advisory Council, with a view to determining by what agencies the project may best be handled, in its larger aspects, and to securing the necessary financial support so that it may be carried forward on an adequate basis. The question of participation by the several Dominion and provincial forestry organizations should be considered, and the efforts correlated in such a way as to produce the best results attainable.

Employment of
Returned
Soldiers

Much attention is being paid to the problem of suitable employment for returned soldiers. In this connection, the possibilities in forestry and fire protection work should not be overlooked. For many of these men, such work would be highly attractive. There would seem to be no reason why, in carrying out a plan for the establishment of vocational schools for the training of returned soldiers, provision should not be made in some way for special courses of instruction in forestry work. Such courses should be of the most practical character, calculated to make the services of the men of great value to Dominion and provincial forestry and fire-protective organizations and to private timber owners as well. Technical forest schools are already in existence at Toronto, Quebec and Fredericton, and another is contemplated at Vancouver. It should be possible to secure the co-operation of these schools in the establishment of supplementary ranger schools, specializing primarily in the several classes of forest engineering work which would best fit the men for the practical duties with which they would be confronted in the lines of government or private employ suggested. Another possibility is the establishment of such courses of instruction direct by the several governmental fire protective organizations, Dominion and provincial. Each of these should be able to provide employment for many returned soldiers, with great mutual advantage, providing the men are properly trained.

Report of the Committee on Lands

BY

F. C. NUNNICK

Agriculturist, Commission of Conservation

THE programme of work carried out by the Branch under the direction of the Committee on Lands during the year 1916 may be summarized as follows:

I. Assistance has been given, through the services of the Agriculturist, in land classification work in New Brunswick.

II. A survey of Dundas county has been made regarding (a) systems and methods of farming, (b) road situation, and (c) public schools in relation to rural occupations.

III. Illustration work has been begun in Dundas county.

IV. General publicity work has been carried on.

LAND CLASSIFICATION WORK IN NEW BRUNSWICK

Until very recently, the classifying of land in advance of settlement in New Brunswick received little attention. Samples of soil from that province had been examined in the soil laboratory at the Experimental Farm, Ottawa, but, previous to 1916, no systematic field examination of soils had been undertaken. In 1916 a forest survey was commenced on the Crown lands of the province. It was also thought wise, while this survey was in progress, to obtain as much information as possible regarding the quality of the soil and as to which districts were suitable for farming or for forest production only. The Commission of Conservation co-operated in this work and arranged to have the Agriculturist of the Commission and Mr. W. L. Graham, from the field husbandry department of the Central Experimental Farm, spend some weeks in the districts then being surveyed, for the purpose of examining the soil and instructing the members of the forest survey parties in the classifying of soils.

Poorer Yield
than Formerly

The work was commenced on June 2, at Weaver, a small station on the Intercolonial railway, near Doaktown, where a very poor agricultural soil was found. Some of the settlers, after 25 or 30 years, had made but small clearings and kept very few stock. These men stated that the yields were poorer than formerly and they depended on working in the woods to earn sufficient to live comfortably. The farming, in many instances, is simply the production of a few potatoes and feed for the team and the few cows kept. Some of the land inspected is absolutely unfit for agricultural purposes and should never be

opened for settlement. An example of this is the land behind the row of lots granted on the Miramichi river, south of Doaktown, and as far back as Cain river. The duff or leaf mould is thin, and is underlain by white or grey sand to a depth of a few inches, under which again is brown sand running down to below plough depth. This land is suited to forest growth only. The same conditions were found south of Boiestown, as far back as Cain river. In some places, a fair agricultural soil was found, as in the Pleasant Ridge settlement, north of Boiestown, but requires good management and intelligent treatment, as it is far from what might be termed a first-class soil.

At Camp No. 1, situated on Haile brook, in the Grimmer and Hazen settlement, a good agricultural soil was found over an area of seven or eight miles.

Small Areas of Good Soil In some places were found small areas of good soil surrounded by mountains or poor soil areas. Some of these small isolated valleys are difficult of access, and do not contain enough good land to provide farms for the number of settlers sufficient to form a community capable of supporting church, school, and other necessary community institutions.

In other places were found burnt-over tracts, where the soil was poor to fair in quality and which would produce no forest revenue for many years. The wisdom of opening such land for settlement is, indeed, questionable; it may depend upon how urgent is the demand for farm land. There are districts, also, where the land is so filled with rocks and boulders that a settler in his lifetime would be unable to clear them out sufficiently to make the land easily cultivable.

These are some of the problems of land settlement in New Brunswick, and serve to emphasize the need for land examination and classification preceding settlement.

A full report of the foregoing examinations was prepared and placed in the hands of the New Brunswick Government. In this report certain recommendations were made, among which were the following:—

That, before Crown land is opened for settlement, an examination be made to determine its agricultural value;

That, in new settlements, such as Grimmer and Hazen, government assistance be given towards determining the most suitable crops, soil, cultural methods and cropping systems, and in improving marketing and transportation facilities.

That, as the depletion of soil fertility in the older districts will have a direct bearing on the settlement of new districts, soil renovation and the keeping of live stock be given special attention in the older communities.



MAKING USE OF MANURE ON A MANITOBA FARM

Manure spreaders will be used to top-dress soil, which will prevent drifting and increase the crop yield.



NEGLECT OF FARMYARD MANURE

Piled under the eaves of barns, allowing the dripping from roof to leach out and carry away the most valuable fertilizing elements.

**Action needed in
other Provinces**

What New Brunswick has done applies with equal force to other provinces. In the past, the provinces administering their own Crown lands and the Dominion have, in many instances, allowed the settler to take up land unsuitable for agriculture. In some cases, it is true, the applicant did not care about the quality of the soil so long as he could get the timber; but, on the other hand, settling on unsuitable land has resulted in many disappointments and failures by men who really wanted to farm.

In taking up Dominion land, the onus of choosing is placed upon the settler. If he knows poor soil from good soil he will not make a mistake, but the man from the city or elsewhere, who knows nothing regarding soils, should be protected. Deserted farms, with their crumbling shacks, tell plainly the story of the failure of those unable to properly choose their farms. These men should be advised and assisted. It is too much to expect that all these mistakes can be righted, but something should be done to prevent their recurrence in future.

DUNDAS COUNTY SURVEY

When the question of an Illustration County was discussed by the Lands Committee it was decided that a general survey of Dundas county should be made, to obtain the information required in planning and carrying out future work therein.

A study, or survey, of Dundas county was, therefore, conducted during the summer of 1916. The agricultural survey included in its consideration such phases of farming operations and farm life as the following:—

1. Systems and methods of farming, such as planning, rotation of crops, seed selection, cultivation, live stock, use of manure, etc.
2. Farm labour, machinery and equipment.
3. Business methods, in selling, buying, co-operation, etc.
4. Public services, such as railways, roads, telephone, rural free delivery, etc.
5. Educational work through schools, school gardens, home gardens, boys' and girls' clubs, school fairs, etc.
6. The promotion of intellectual, social, moral and ethical progress.

Four hundred farmers were chosen in groups of 25, there being four of these groups in each of the four townships of the county.

The survey was conducted by a special representative of the Commission, a third-year student of the Ontario Agricultural College who personally visited each farmer. The information was obtained from his own observation and from the evidence of the farmers. The results of the survey have been tabulated and may be summarized as follows:—

Farm Practice	<p>ROTATION AND SEED.—Twenty-one per cent of the farmers claimed to follow a systematic rotation, while 74 per cent followed a rotation on part of the farm only. Ninety-seven per cent used seed grown on their own farms, while 60 per cent occasionally bought or exchanged their grain for seed. Less than one per cent practised systematic selection of their seed grain, that is, a selection similar to that followed by members of the Canadian Seed Growers' Association. Twenty-four per cent kept the best part or parts of their fields of grain for seed. Ninety-nine per cent cleaned their grain for seed but only 25 per cent cleaned it more than once. Three per cent treated their seed grain for smut. Only nine per cent of the farmers visited were growing wheat. Practically every farmer was growing oats, but only 53 per cent knew the name of the variety being grown; only 13 per cent knew the name of the variety of barley being grown. Forty-three per cent of the farmers did not know the name of the variety of any of the grain being sown on their farms. Among those knowing the name of the variety of oats they were growing, 14 distinct varieties were found. Only three per cent grew their own clover seed, while 91 per cent grew their own timothy seed. Sixty-four per cent of the grain sown in 1916 was seeded to clover. The average amount of red clover seed sown per acre was from four to five pounds. On 40 per cent of the farms alsike was also being added to the seeding mixture. The average amount of timothy seed sown per acre was from 10 to 12 pounds. Only five per cent were growing alfalfa and they grew it in only small quantities and sometimes with indifferent success. Fifty-eight per cent of the farmers reported an increase in crop yield over 10 years ago, while 33 per cent reported about the same. The average increase of those reporting an increase was between six and seven per cent.</p>
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WEEDS.—The three most troublesome weeds were Canada thistle, couch grass and sow thistle. Sixty-three per cent reported Canada thistle as troublesome and 38 per cent reported it as increasing. Seventy-nine per cent reported couch grass and 35 per cent reported it as increasing. Seventy-seven per cent reported sow thistle with 12 per cent reporting it increasing. Many other weeds were reported but the above were the worst.

LIVE STOCK.—Practically every farmer kept cows, the average number being from 14 to 15. Only 14 per cent kept sheep and the average number being kept was from 12 to 18. Ninety-nine per cent kept brood sows and fattened swine annually, the average number fattened being from 26 to 29. Almost every farmer kept hens, averaging from 85 to 90.

Manures and Fertilizers All of the farmers visited used farm-yard manure, at the rate of from 17 to 18 tons per acre. Fifteen per cent used it on the hoe crop only, while 85 per cent used it on meadow or young seeding and a part on the hoe crop or grain. Only two farmers among the 400 were using chemical fertilizers. Only five per cent had a manure shed or cellar in which to store the manure. Less than one per cent saved all of the liquid manure. Eighty-nine per cent exercised no special care to prevent waste, while 10 per cent prevented waste by either drawing the manure to the field as made, or carefully piling it. No one was saving all of the liquid manure and at the same time exercising good care to prevent waste.

Gardens Eighty per cent grew no small fruits, but 98 per cent had vegetable gardens. Forty-five per cent of these gardens were well kept and 53 per cent were in a neglected condition.

Implements and Buildings Forty-two per cent did not house all of their implements when not in use. Seventy-eight per cent had implement sheds but a number of those did not have room for all of the implements. Forty-three per cent had their barns lightning rodded but only five per cent their houses. Twenty per cent of the houses were not well painted and 87 per cent did not have their barns painted. Nearly every farmer mentioned dairying as a special line of his farming operations.

Labour Outside male help was employed by fifty-one per cent of the farmers while five per cent employed female help. Sixteen per cent only employed their male help by the year, 11 per cent by the month and 25 per cent by the day. Thirty-four per cent employed Canadian born help, while 16 per cent employed British born. Forty-six per cent employing help reported the labour as satisfactory, and 51 per cent as unsatisfactory. Five per cent employed married men, while seven per cent of the farmers visited had houses for the hired men, but many of these houses were not in proper repair. Ninety-five per cent reported farm help scarce as so many had gone to the war;

96 per cent reported domestic help scarce. To overcome the scarcity of labour, 25 per cent suggested immigration. Ninety-eight per cent exchanged work with their neighbours in threshing, silo filling and where otherwise necessary. Fifteen per cent had gasolene engines and 19 per cent had windmills.

Fuel Twenty-four per cent used wood for fuel while 72 per cent used both wood and coal. Fifty-three per cent had a wood supply which would last indefinitely and 11 per cent had supplies which would last for a few years only at the present rate of consumption. Ten per cent had a definite wood lot set aside. No one had done any forest planting.

House Conveniences In practically every home a washing machine was found. All of the farmers obtain their water from wells, 93 per cent of the wells being situated from 10 to 50 feet from the house. Ninety-four per cent conveyed the water to the house by hand. Eighty-two per cent had water on tap in the house, principally soft water. Twenty per cent had the W. C. in the house, 35 per cent had a bathroom and 18 per cent had a complete service. All the houses used oil for lighting; 60 per cent were heated with stoves and 40 per cent with furnaces.

Organization and Co-operation Practically none of the farmers sold hay or grain from their farms, and less than two per cent sold farm produce co-operatively. Marketing in Dundas county is somewhat difficult in many instances owing to the distance—thirty-three per cent of the farmers over five miles from a shipping point and only 17 per cent within two miles. Only 14 per cent purchased any farm supplies co-operatively. Eighty-three per cent sold their live stock to drovers and the same percentage sold some farm produce through middlemen. There is a splendid opportunity for the organization of co-operative buying and selling associations in Dundas county.

Roads and Transportation In all cases the roads are maintained by statute labour, eighty-six per cent of the farmers reporting the use of earth in the construction and maintenance of same. Fifty per cent suggested state or county control as a means of improvement. Ninety-six per cent reported the transportation service as being by rail and three per cent by rail and water. Fifty per cent reported the service satisfactory, and 47 per cent only fair. Sixty-six per cent considered the rates too high. It may be interesting to note that since this survey was made in the united counties of Dundas, Stormont and Glengarry arrangements have been completed for about 430 miles of good roads, under the Ontario

Government good roads system, 130 miles of which will be in Dundas. The work on these roads will likely be commenced in the spring of 1917.

Education Ninety-eight per cent of the farmers visited had attended public school only and only one per cent high school. None had attended college and only one had attended business college.

The above would indicate that, if the farmers' training is to be improved, it must be through the rural school; hence, the wisdom and advisability of making the rural school training as efficient, adequate and suitable as possible to prepare the young men and young women for real life in the country. Teaching of agriculture might well occupy a more prominent place on the rural school curriculum than it does at present.

Ninety-two per cent of the farmers' wives had attended public school only, three per cent had attended high school and none had attended college. Nine per cent reported the children as having school gardens, while 22 per cent reported having a home garden under the supervision of the teacher. Twenty-nine per cent reported helpful visits from the District Representative. Forty-seven per cent had attended a short course in agriculture and 93 per cent favoured short courses held for the young people. Many of these short courses are held in various parts of the county, to which all of the farmers are invited, and consist of judging classes in seed grain and live stock. Ninety-seven per cent were satisfied with the schools as at present managed. An occasional suggestion was made for more agriculture, continuation classes, manual training and public speaking, as an improvement.

**Opportunities
for Social Life** Sixty-six per cent of the farmers keep the grounds around the home in neat condition. Seventy-eight per cent had telephone, 94 per cent rural free delivery, and sixteen per cent automobiles. The automobile and complete water service are approximately equal in Dundas county, the automobiles having gained rapidly during the past summer. In 75 per cent of the families there were young people over 14 years of age, and in 71 per cent there was either a horse and buggy or auto for them. Practically all of the farmers with their families attended some community event or events during the past year, and sixteen per cent of the farmers attended some fixed social event, such as a lodge. Only three per cent reported any organized clubs for games and less than one per cent reported anything in the way of neighbourhood playgrounds. Fifty-one per cent had a piano, while 33 per cent had an organ in the house.

Miscellaneous Twelve per cent reported sons and 11 per cent daughters who had gone to the city. Twelve per cent had sons married who were farming and eight per cent had sons married in other occupations. Eighty-three per cent of the farmers visited were born in the county and ninety-nine per cent in Ontario. Ninety-six per cent were raised in the country and two per cent in town. Thirty-eight per cent claimed to follow some form of book-keeping, while only one per cent reported a complete method. Ninety-six per cent received Government bulletins and 82 per cent claimed to read them. Seventy-seven per cent were taking agricultural papers, 11 per cent story magazines and 93 per cent a daily paper. Four per cent belonged to a library. The high percentage of those receiving a daily paper may be due to the interest being taken in the war and to the fact that 94 per cent have rural free delivery.

EXAMINATION OF ROAD SITUATION

An examination of the road situation in Dundas county was conducted for the Committee on Lands by Mr. E. A. James, B. A. Sc., C. E. The investigation included the following:—

1. The general road conditions;
2. The quality, quantity and availability of road metal in the county;
3. Drainage problems;
4. Methods of maintaining connecting or cross-roads which are not included in the county system;
5. Labour problem re county roads;
6. Miscellaneous and suggestions.

It may be noted that the united counties of Dundas, Stormont and Glengarry have completed plans, under the direction of the Ontario Government, for the macadamizing of over 400 miles of main roads. About one-third of this work will be in Dundas county. The work, it is expected, will be commenced in the spring of 1917.

The effect of good roads in rural communities is truly marvellous. According to the *Weekly News Letter* of November 8, 1916, issued by the United States Department of Agriculture, good roads have been responsible for increased school attendance, improved social conditions, enlarged business transactions, and an increase in the selling price of tillable land of more than the cost of the roads. On account of the great importance of good roads to the community



PURE BRED AND WELL KEPT DAIRY STOCK

Labour and feeding cost is no higher than that required to support inferior grades of cattle.



SCHOOL FAIR, SOUTH MOUNTAIN, DUNDAS CO.

The children's interest is greatly encouraged in seed and variety selection, and the lessons are carried home to the parents.

the Committee on Lands is encouraging and assisting in every possible way the good roads movement in the Illustration county.

**Illustration
County Work** The co-operation of the Commission of Conservation with the departments and branches of the Provincial and Federal Governments concerned will be continued in an effort to improve conditions in Dundas county along the following lines: (1) Farm management and practice, (2) farm labour, (3) organization and co-operation, (4) roads and transportation, (5) agricultural education, and (6) opportunities for social recreation.

In each of these matters more progress has been made in some one community than in others. It is hoped to bring into operation in Dundas county all the means and methods found most useful and valuable in other counties along the above mentioned lines.

Different lines of illustration work have been planned and will be begun in the spring. For example: Practical illustrations in the application of lime have been arranged for at different points in the county, and arrangements have been made for a series of farmers' meetings to develop social and recreational opportunities.

Many of the teachers in the county are commencing to teach agriculture in the public schools; this is prescribed in the public school register, but is, as yet, entirely optional. Mr. J. W. Forrester, the public school inspector for the county, has circularized the teachers, pointing out the advisability and urging them to take up the teaching of agriculture in their schools, and it is expected many will do so. Mr. Forrester has supplied the following information:—

There are 78 schools in Dundas county.

There were three school fairs held in 1916.

There are probably about 10 boys' and girls' agricultural clubs.

There were 12 school gardens in 1916.

There were 47 home gardens under the supervision of the teacher.

Eight teachers have full elementary certificates in agriculture, and four have the first part of this certificate.

Twelve teachers have taken the Guelph Short Course, or other supplementary courses.

The teachers use their knowledge of agriculture in giving instruction in either school garden or home garden work. The difference between the teaching and matter taught, in the case of a teacher certified in agriculture and one who is not, is very evident when a school is visited and the children examined.

Where agriculture is taught, either as school garden or home garden work, the results are quite apparent. I have been told, in not a few cases, that improved methods of caring for fruit trees—

including spraying—and the selection of good seed grain, have been introduced by the school children. In the matter of poultry feeding and selection of a type, interest has been aroused and progress made. Even the matter of fertilizers has been spoken of, and the growing of leguminous crops to enrich the soil with nitrogen compounds.

There is, and will continue to be, more or less adverse criticism from the old conservative type of farmer; but the great hope of scientific agriculture rests with the boys and girls, and the young men who are farming. Every method employed to elevate and to improve conditions, in this greatest of all industries, is deserving of the best that can be given it.

The co-operation, assistance and advice received from Mr. E. P. Bradt, the District Representative for Dundas county, have been of great value and are hereby gratefully acknowledged.

Seventeen meetings were addressed during the year by the Agriculturist of the Commission in the interests of conservation and agricultural instruction.

AGRICULTURAL SURVEY, 1916

The following table gives the figures in detail of the survey conducted on 400 farms in the county of Dundas, Ontario, by the Commission of Conservation during 1916:

AGE, AREA AND SOIL

	Wil- liams- burg	Win- chester	Moun- tain	Matilda	Aver- age
Average age.....	46	50	46	47	47.2
Percentage under 30 years of age.....	2	..	4	3	2.2
“ from 30 to 49 years (incl.).....	56	51	50	50	51.7
“ from 50 to 69 years (incl.).....	41	45	42	41	42.2
“ 70 years and over.....	..	3	..	1	1
“ of owners.....	93	98	95	91	94.2
“ of tenants.....	6	2	5	8	5.2
“ tenant and owner.....	1	..	..	1	.5
Average size of tenant farm, acres.....	96	75	86	80	..
“ size of owned farm, acres.....	98	112	108	106	..
“ number of acres per farm in grain....	19	23	25	26	..
“ number of acres per farm in hoe crop..	7	10	9	8	..
“ number of acres per farm in cultivated hay and pasture.....	63	68	58	58	..
“ number of acres per farm in hay, pas- ture and crops.....	89	100	91	90	..
Percentage practising summer fallowing.....	..	..	7	5	3
Average area of summer fallow of those prac- tising the same, acres.....	..	..	5	7	..
Percentage having woods.....	85	68	63	55	67.7
Average acreage in woods of those having woods	6	9	10	10	..
Percentage having untillable land other than woods.....	69	44	26	22	40.2
Average acreage untillable of those having until- lable land.....	3	5	14	6	..
Percentage having uncultivated tillable land..	100	95	84	49	82
Average acreage of those having uncultivated tillable land.....	2	2	3	4	..
Percentage having clay soil on farm.....	100	86	39	76	75.2
“ having clay loam on farm.....	95	89	73	49	76.5
“ having gravelly soil on farm.....	4	20	3	18	11.2
“ having sandy loam on farm.....	..	..	13	13	6.5
“ having sandy soil on farm.....	..	..	9	5	3.5
“ having orchard on farm.....	16	47	48	47	39.5
Average size of orchard, acres.....	1	1.5	2.5	2	..
(Many have several varieties of soil on same farm.)					

ROTATION AND SEED

Percentage following systematic rotation.....	1	20	36	29	21.5
“ following rotation on part of farm..	92	80	63	63	74.5
“ using seed grown on own farm....	99	98	97	95	97.2
“ occasionally buying or exchanging seed.....	64	63	60	55	60.5

ROTATION AND SEED—*Continued*

	Wil- liams- burg	Win- chester	Moun- tain	Matilda	Aver- age
Percentage practising systematic selection of seed grain . . . . .	..	1	1	1	.7
“ obtaining seed from best part of fields	13	11	32	39	23.7
“ cleaning seed grain	100	100	100	97	99.2
“ cleaning seed grain once	96	73	69	57	73.7
“ cleaning seed grain twice	4	27	31	40	25.5
“ treating for smut	3	..	6	3	3
“ growing wheat	1	15	10	10	9
“ knowing name of wheat grown . . .	1	13	10	7	7.7
“ not knowing name of wheat grown .	..	2	..	3	1.2
“ growing oats	100	100	100	94	98.5
“ knowing name of oats grown	44	64	57	48	53.2
“ not knowing name of oats grown . .	56	36	43	46	45.2
“ growing barley	100	100	99	81	95
“ knowing name of barley grown . . .	3	19	20	12	13.5
“ not knowing name of barley grown .	97	81	79	69	81.5
“ not knowing name of any variety of grain sown	55	32	37	48	43
“ growing mixed grain	98	94	98	91	95.2
Number of varieties of wheat stated as being grown	1	1	1	2	..
Percentage growing two or more varieties of oats	2	5	..	..	1.7
Number of varieties stated as being grown	6	11	9	8	..
Total number of varieties found in county . . . .	..	..	..	..	14
Number of varieties of barley stated as being grown	1	2	2	2	..
Percentage growing their own clover seed	7	..	2	5	3.5
“ growing their own timothy seed . . .	98	90	88	88	91
“ of grain sown seeded to clover in 1916	76	69	52	61	64.5
“ sowing red clover in 1916	98	100	95	87	95
Average number of pounds of red clover sown per acre	5	5	4	4	..
Percentage sowing alsike in 1916 . . . . .	..	27	73	63	40.7
Average number of pounds of alsike sown per acre . . . . .	..	2	2	1	..
Percentage sowing timothy in 1916	100	100	100	98	99.5
Average number of pounds of timothy sown per acre	12	11	10	11	..
Percentage growing alfalfa . . . . .	..	6	5	9	5
Average number of acres per farm of those growing alfalfa . . . . .	..	5	5	4	..
Percentage reporting increase in crop yield over 10 years ago	55	76	53	49	58.2
Average per cent increase of those reporting increase	5	8	8	8	..
Percentage reporting same yield as 10 years ago	44	20	40	31	33.7
“ reporting poorer yield than 10 years ago . . . . .	..	1	14	16	7.7
“ reporting increase over 20 years ago	91	83	74	53	75.2
Average increase of those reporting increase . . .	6	12	11	10	..
Percentage reporting same yield as 20 years ago	6	10	10	14	10
“ reporting poorer yield than 20 years ago	2	2	7	24	8.7

REPORT OF THE COMMITTEE ON LANDS

MANURES AND FERTILIZERS

	Wil- liams- burg	Win- chester	Moun- tain	Matilda	Average
Percentage making use of farmyard manure . . .	100	100	100	100	100
Average number of tons of manure applied per acre	17	18	18	17	..
Percentage using manure on hoe crop only	1	14	22	23	15
“ using manure on meadow or young seeding and part on hoe crop or grain	99	86	78	76	84.7
“ using chemical fertilizers . . . . .	..	..	..	2	.5
“ having manure shed	2	9	4	4	4.7
“ having manure cellar . . . . .	..	..	..	..	..
“ saving all of liquid manure . . . . .	..	..	..	3	.7
“ exercising no care to prevent waste of manure	96	83	96	82	89.2
“ exercising some care to prevent waste of manure	4	17	4	18	10.8
“ exercising good care to prevent waste of manure . . . . .	..	..	..	..	..
“ growing four or more varieties of small fruits . . . . .	..	..	..	3	.7
“ growing no small fruits	99	87	69	67	80.5
“ growing one to three varieties	1	13	8	28	12.5
“ having vegetable garden	100	98	99	96	98.2
“ of gardens well kept	43	44	42	52	45.2
“ of gardens neglected	57	56	57	44	53.5

FUEL

Percentage using wood for fuel	53	9	22	13	24.2
“ using wood and coal	46	91	75	79	72.7
“ using coal	1	..	3	7	2.7
“ having supply of wood which will last indefinitely	72	64	46	30	53
“ having supply of wood which will not last indefinitely at present rate of consumption	3	3	16	22	11
Average number of years wood supply will last . .	10	10	10	13	..
Percentage having definite wood-lot set aside . .	..	21	5	17	10.7
Average size of definite wood-lot in acres . . . .	..	6	8	7	..
Percentage having done any forest planting . . .	..	..	..	..	..

LIVE STOCK

Average number of cows kept	14	15	15	14	..
“ number of other cattle kept	7	9	7	7	..
“ number of working horses kept	3	5.5	4.5	4	..
Percentage having colts on farm	74	63	66	79	70.5
Average number of colts on farms where colts are raised	1.1	1.5	1.5	1.3	..
Percentage keeping sheep on their farms	18	18	8	12	14
Average number of sheep on farms where sheep are kept	12	15	15	18	..
Percentage keeping brood sows	100	100	99	98	99.2
Average number of brood sows kept	1.7	2	2	2	..
Percentage reporting disease among stock in recent years . . . . .	..	..	7	9	4
“ fattening swine annually	100	98	99	99	99
Average number fattened annually	26	29	27	26	..
“ number of hens kept annually	91	90	87	86	..

LABOUR AND CONVENIENCES

	Will- iams- burg	Win- chester	Moun- tain	Matilda	Aver- age
Percentage employing outside male help.....	41	54	55	55	51.2
Average number of days of male help employed..	80	211	171	216	..
Percentage employing female help.....	1	8	7	4	5
Average number of days of female help employed	365	365	365	365	..
Percentage employing male help by the year..	5	23	15	22	16.2
“ employing male help by the month	18	4	10	13	11.2
“ employing male help by the day...	27	25	29	19	25
“ employing Canadian born help....	25	42	37	34	34.5
“ employing British born help.....	16	12	17	21	16.5
“ employing foreign born help other than British.....	..	..	..	..	..
“ of those employing help reporting labour satisfactory.....	29	55	58	45	46.7
“ of those employing labour reporting labour not satisfactory.....	68	44	42	51	51.2
“ employing married man.....	1	6	7	7	5.2
“ having house for hired man.....	1	9	8	12	7.5
“ paying members of family.....	..	5	15	5	6.2
“ having members of family as part- ners.....	..	..	..	..	..
“ reporting farm help scarce.....	98	99	96	89	95.5
“ reporting domestic help scarce....	97	97	99	92	96.2
“ exchanging work with neighbours..	100	99	99	96	98.5
“ having gasoline engine on farm....	5	21	21	12	14.7
“ having windmill on farm.....	5	25	25	23	19.5
“ having washing machine in house..	100	100	99	100	99.7
“ obtaining water from well.....	100	100	100	100	100
“ having well less than 10 feet from or in house.....	..	5	7	5	4.2
“ having well from 10 to 50 feet (inclusive) from house.....	99	95	92	86	93
“ having well over 50 feet from house	..	..	..	7	1.7
“ having well less than 25 feet from stable or manure dump.....	..	..	..	3	.7
“ having well from 25 to 50 feet (inclusive) from stable or manure dump.....	..	..	1	2	.7
“ having well over 50 feet from stable or manure dump.....	99	100	99	92	97.5
“ conveying water to house by hand	100	95	91	91	94.2
“ having water piped to house.....	..	..	..	3	.7
“ having water conveyed to house by pump.....	..	5	9	6	5
“ having water in house (either rain or well water).....	84	90	74	79	81.7
“ having w. c. in house.....	5	27	24	23	19.7
“ having bathroom in house.....	8	50	41	43	35.5
“ having complete service.....	3	27	24	20	18.5
“ having house lighted with oil.....	100	100	100	100	100
“ having house heated with stoves...	52	51	72	64	59.7
“ having house heated with furnace..	48	49	28	35	40
“ not selling any hay from farm....	100	100	98	92	97.5
Average number of tons sold from farms where hay is sold.....	..	..	22	23	..
“ number of tons of hay fed per farm on all farms.....	31	35	35	33	..
Percentage not selling any grain from farm.....	100	100	100	94	98.5

LABOUR AND CONVENIENCES—*Continued*

	Wil- liams- burg	Win- chester	Moun- tain	Matilda	Aver- age
Average number of bushels of grain sold from farms selling grain . . . . .	..	..	..	359	..
“ number of bushels of grain fed per farm on all farms	1103	1250	831	921	..
Percentage selling potatoes . . . . .	..	5	..	2	1.7
Average number of bushels sold . . . . .	..	49	..	50	..
“ number of bushels of roots sold . . . . .	..	..	..	..	..
Percentage feeding roots	47	35	11	24	29.2
Average number of bushels of roots fed	65	143	172	188	..
Percentage making use of straw as feed, bedding, etc.	100	100	100	99	99.7
Average number of miles from shipping point . .	4.5	2.6	3.3	5.4	..
Percentage 2 miles or less from shipping point	9	36	18	5	17
“ over 2 miles and less than 5 miles . .	27	61	69	41	49.5
“ 5 miles or more	63	2	13	54	33
“ selling some farm produce co-operatively . . . . .	..	..	..	7	1.7
“ purchasing farm supplies co-operatively . . . . .	..	4	17	34	13.7
“ selling fruit through commission men . . . . .	..	..	1	..	.2
“ selling live stock to drovers only . .	98	98	63	75	83.5
“ selling live stock to butchers only . .	1	..	..	1	.5
“ selling live stock, part to butchers and part to drovers	1	1	35	22	14.7
“ selling some farm produce through middlemen	96	80	91	67	83.5
“ selling some farm produce through commission men . . . . .	..	1	3	2	1.5

ROADS AND TRANSPORTATION

Percentage reporting roads maintained by statute labour	99	100	100	100	99.7
“ reporting use of gravel or stone on roads	1	6	15	17	9.7
“ reporting use of earth on roads	97	94	79	74	86
“ suggesting state or county control of roads as a means of improvement	68	42	54	35	49.7
“ reporting transportation service by rail	99	100	100	86	96.2
“ reporting transportation service by rail and water . . . . .	..	..	..	14	3.5
“ reporting service satisfactory	39	46	59	57	50.2
“ reporting service fair	59	53	40	36	47
“ reporting service not satisfactory . .	..	..	..	3	.7
“ considering rates high	85	72	58	49	66

EDUCATION

	Wil- liams- burg	Win- chester	Moun- tain	Matilda	Aver- age
Percentage of farmers having attended public school only.....	99	99	95	99	98
“ of farmers having attended high school.....	..	1	4	..	1.2
“ of farmers having attended college.....	..	..	..	..	..
“ of farmers having attended business college.....	..	..	..	1	.2
“ of farmers' wives having attended public school only.....	98	97	91	82	92
“ of farmers' wives having attended high school.....	..	3	4	5	3
“ of farmers' wives who were school teachers.....	..	..	1	..	.2
“ of farmers' wives who attended college.....	..	..	..	..	..
“ reporting children having school garden.....	2	7	10	16	8.7
“ reporting children having home garden under teacher.....	..	37	22	29	22
“ favourable toward Farmers' Institutes.....	1	2	8	15	6.5
“ unfavourable toward Institutes.....	86	57	51	55	62.2
“ reporting visits of District Representative as helpful.....	14	34	35	33	29
“ having attended a short course in agriculture.....	55	48	61	26	47.5
“ reporting favourable attitude toward short courses.....	93	94	93	93	93.2
“ reporting no desire for short courses for young people.....	..	..	2	6	2
“ reporting a desire for short courses for young people.....	93	94	98	94	94.7
“ reporting the school as satisfactory.....	98	99	98	95	97.5
“ reporting school too expensive or salary too high.....	1	1	..	2	1
“ suggesting continuation classes....	..	..	..	1	.2
“ suggesting manual training and public speaking.....	..	..	..	1	.2
“ having children at home under 14 years of age.....	68	64	47	50	57.2
Average number of children under 14 in families having such.....	1.4	1.5	2	2	..
Percentage having children between 6 and 14 years of age.....	62	58	42	45	51.7
Average number of children between 6 and 14 in families having such.....	1.8	1.3	1.6	1.5	..
Percentage having children attending school....	66	57	41	49	53.2
Average number of school children in families having such.....	1.1	1.3	1.5	1.8	..
Percentage having boys at home over 14 years of age.....	72	84	61	63	70
Average number of boys over 14 in families having such.....	1.2	1.2	1.4	1.3	..
Percentage having girls at home over 14 years of age.....	48	50	38	38	43.5
Average number of girls at home over 14 in families having such.....	1.3	1	1.2	1	..
Percentage of families from which boys have gone to city.....	13	15	12	9	12.2

EDUCATION—Continued

	Wil- liams- burg	Win- chester	Moun- tain	Matilda	Aver- age
Average number of boys per family gone to city	1.1	1	1	1	..
Percentage of families from which girls have gone to city.....	9	16	10	8	10.7
Average number of girls per family gone to city	1.3	1.2	1.5	1	..
Percentage of families having sons married who are farming.....	4	20	14	11	12.2
Average number of sons married who are farming in families having such.....	1.2	1	1.3	1	..
Percentage having sons married in other occupations.....	4	14	6	8	8
Average number of sons married in other occupations, in families having such.....	1.2	1	1	1	..
Average size of family, including parents.....	4.5	4.5	4.1	4	..
Percentage of farmers visited born in the county	90	79	74	92	83.7
Percentage of farmers visited born in Ontario	100	98	98	99	98.7
“ raised in town.....	1	2	5	2	2.5
“ raised in the country.....	99	98	94	98	96.2
“ following any form of book-keeping	17	32	45	58	38
“ following complete method of book-keeping.....	1	..	1	2	1
“ receiving Government bulletins....	93	96	100	95	96
“ stating that they read the bulletins	89	80	88	72	82.2
“ taking agricultural papers.....	83	66	81	79	77.2
“ taking story magazines.....	..	7	22	15	11
“ belonging to library.....	1	10	4	2	4.2
“ taking a daily paper.....	100	98	88	89	93.7

SOCIAL LIFE

Percentage keeping grounds around house in neat condition.....	71	76	57	60	66
“ having telephone.....	78	70	90	74	78
“ having rural free delivery.....	96	95	93	91	93.7
“ having automobile.....	8	27	15	12	15.5
“ of families having young people over 14 years of age.....	78	87	68	68	75.2
“ having horse and buggy, or auto, for young people.....	73	86	61	67	71.7
“ of farmers attending some kind of community event or events during past year.....	100	100	100	95	98.7
“ of farmers' families attending some community event in the past year	100	100	100	96	99
“ of farmers attending fixed social events, as lodge.....	15	7	15	26	15.7
“ reporting organized clubs for games	..	3	2	7	3
“ reporting any neighbourhood playgrounds.....	..	..	..	2	.5
“ having no musical instrument in house.....	17	9	16	12	13.5
“ having piano in house.....	46	70	41	46	50.7
“ having organ in house.....	31	19	43	42	33.7
“ having smaller instrument as gramophone or violin.....	6	..	..	..	1.5
“ having in addition to piano or organ some smaller instrument.....	..	2	6	3	2.7

MISCELLANEOUS

	Wil- liams- burg	Win- chester	Moun- tain	Matilda	Aver- age
Percentage not housing all implements when not in use.....	41	42	41	43	41.7
" having implement shed.....	59	89	73	93	78.5
" having barn lightning rodde.....	49	46	41	36	43
" having house lightning rodde.....	1	2	6	10	4.7
" stating that they paint their imple- ments at regular intervals.....	4	..	1	7	3
" not having house well painted.....	16	13	26	25	20
" not having barn painted.....	98	81	91	80	87.5
" reporting lack of suitable labour as a drawback.....	2	5	22	9	9.5
" reporting lack of drainage as a drawback.....	..	..	..	2	.5
" reporting distance from railway as a drawback.....	1	..	..	12	3.2
" mentioning dairying as one of their special branches of farming.....	100	100	99	87	96.5

The Water-Power Situation in Canada

BY

ARTHUR V. WHITE

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DURING the past year, some of the more important water problems have been receiving attention from the Commission of Conservation.

Reference is made herein to the Long Sault rapids, St. Lawrence river; to the Chicago Drainage canal; to the Lake of the Woods investigation, and to other problems. Special attention has been given to the power situation at Niagara Falls, because of the acute condition which has there arisen, and because of its great national importance.

LONG SAULT RAPIDS, ST. LAWRENCE RIVER

The charter of the Long Sault Development Co. having been declared unconstitutional, the company has been exerting strong efforts to secure a re-establishment of its status with respect to its former charter. The case was presented for argument before the Supreme Court of the United States on April 14 and 17, 1916.

The burden of the argument before the court turned upon the question of jurisdiction. The main contention of the defendant—the state of New York—was that the Long Sault Development Company Act was unconstitutional. It had been so declared by the highest court of the state, and the state contended that the decision of this court in a matter of this kind cannot be reviewed by the Supreme Court of the United States, being outside its jurisdiction. The state also contended that the charter was not a contract.

The chief contention of the plaintiff—the Long Sault Development Co.—was that the Supreme Court had jurisdiction, and should find that the action of the state of New York had been to enter into a *contract*, and, that neither the state nor its courts had any right to set this contract aside; and, further, that when such contracts were violated, the matter became a subject that fell within the jurisdiction of the Supreme Court.

Mr. Justice Hughes—who was Governor of New York when the Long Sault Co. charter was granted—did not sit on the case and

his retirement left the court with a bare quorum. Subsequently it was announced, in view of the importance of the case, that the court would not reach a decision without having the case re-argued before a fuller bench. The arguments on re-hearing were presented on October 31, 1916.* On December 11th, the court dismissed the application of the Long Sault Co.

The Long Sault Development Co. desired to proceed with its construction of *dams and other works in the St. Lawrence river*. That this is the object the company had in view, in bringing its action, is clearly discerned in the words of the counsel for the company, Mr. Henry W. Taft, who, when before the Supreme Court on April 14, 1916, stated:

"Since the passage of the act the company has made, without success, diligent efforts to obtain the consent of Congress, and, when the present embargo against the building of dams has been raised, will proceed again to obtain that consent."

The Commission of Conservation in a special report has gone on record respecting the Long Sault power project.

The conditions which have grown out of the exportation of electricity at Niagara demonstrate the soundness of the policy set forth by the Commission of Conservation in its protest of February 7th, 1910, against the granting of a charter to the Long Sault Company, empowering them to develop the water-power of the Long Sault rapids. This situation is referred to in more detail on pp. 239-240.

WATER DIVERSION BY SANITARY DISTRICT OF CHICAGO

The illegal diversion of water by the Sanitary District of Chicago still continues.

The waters along the international boundary between Canada and the United States are a joint asset in which each country is entitled to receive equal benefits. Nothing should be done in one country that would either violate, or even prejudicially affect, the interests of the other country. *Boundary waters should be kept within their own watersheds.*

In deciding against the Minnesota Canal Power Co.'s proposed diversion of the Birch Lake waters from the Lake of the Woods watershed to that of the Great lakes, the courts of Minnesota have upheld this principle, and rendered signal service to the conservation of boundary waters, by having them retained within their own watersheds.

* See Appendix V. for official Decision.



FLOOD CONDITIONS ON RAINY RIVER, SPRING, 1916
Front street, Fort Frances, Ont. Water being held back by sandbags.



FLOOD CONDITIONS ON RAINY RIVER, SPRING, 1916
Front street, Fort Frances. Inundated residences.

Although Canada, for some years, has been suffering on account of the illegal diverting of the waters of the Great Lakes system through the Chicago Drainage canal into the Mississippi river, it is hoped that the proceedings taken by the United States Federal Government against the Sanitary District of Chicago may yet result in restoring to the Great Lakes system the waters which Chicago, at present, is diverting in defiance of authority.

LAKE OF THE WOODS INVESTIGATION BY THE INTERNATIONAL JOINT COMMISSION

In January and February, 1916, the International Joint Commission held final public hearings relating to the Lake of the Woods investigation. These hearings were opened at International Falls, Minn., by a committee of the Commission, for the purpose of obtaining evidence respecting land values—more especially in the vicinity of Rainy lake. Exhibits relating to land values and areas flooded, or subject to possible flooding, were filed by the state of Minnesota and by representatives of certain riparian owners. Testimony relating to the matters in question was received from the various interests represented.

Immediately following the adjournment at International Falls, the hearings were continued at Winnipeg, before the full Commission. These hearings at Winnipeg were called largely for the purpose of permitting those interested in power to make their representations. There, the data and conclusions presented by the consulting engineers in their preliminary report to the Commission were discussed, and the question of the relation of the regulation of the levels and outflow of the Lake of the Woods to power development was also fully discussed by counsel and engineers representing the power interests.

In April, at Washington, D. C., the Commission heard the final arguments of counsel representing the various interests affected by regulation on the Lake of the Woods.

Executive meetings were held in September at Ogdensburg, N. Y., and at Ottawa in October. There is now in preparation for transmission to their respective governments, a report by the Commissioners respecting the regulation of the Lake of the Woods waters.

During the summer of 1916, extraordinary flood conditions prevailed on the watershed of the Lake of the Woods. For the six months from November, 1915, to April, 1916, the precipitation, on the Lake of the Woods watershed, exceeded any other similar period during the past 44 years—the term for which records are available.

Unusual High Water

In July, 1916 the Lake of the Woods rose to a stage of 1,064.0, sea-level datum, being 1.5 feet above the former extreme high water mark as recorded upon the rocks. Rainy lake reached a stage of 500.9, Public Works, Canada, datum and lake Namakan a stage of 511.2, Public Works, Canada, datum. It may here be remarked that the highest computed natural levels in 1916 for lake of the Woods, Rainy lake and lake Namakan would have been 1,060.9, 499.6 and 507.5, respectively. The crest of the flood on the lake of the Woods was reached in July.

Commissioners Charles A. Magrath and James A. Tawney visited the district at the time of the flood and made a report upon the situation to both governments.* The towns of Warroad, Rainy River, Baudette, Fort Frances and Ranier; property owners on the shores of lake of the Woods, Rainy and Namakan lakes, Rainy and Winnipeg rivers, the pulp and paper mills at Fort Frances and International Falls, and the main line of the Canadian Northern railway across Rainy lake, may be mentioned as representative of the interests which were more or less seriously handicapped and damaged by high water.

The flood conditions of 1916 strikingly emphasized the urgent need for an efficient, co-ordinated system of regulation and control of the waters of the Lake of the Woods watershed.

Field work carried on under the direction of the consulting engineers in 1916 consisted of topographical surveys on Rainy lake and Rainy river in the vicinity of Fort Frances and International Falls. The field parties were in charge of Mr. G. S. Stairs and Mr. G. M. Shepard. Various government departments in both countries have continued to render valuable assistance to the Commission in the furnishing of essential data relating more particularly to studies of run-off.

NIAGARA POWER

Coal Situation and Exportation of Electrical Power

The coal problem, especially in the central portion of Canada, is a serious one. The two fuels which, for power generation, may be considered as competitors of water are crude oil and coal. Crude oil, so far as large portions of industrial Canada are concerned, is out of the question. Respecting coal, the prices for this commodity are materially increasing year by year, and doubtless this upward movement will continue.

* *Flood Conditions on Boundary of Minnesota and Ontario*: Report on the flood conditions in the Lake of the Woods and Rainy Lake districts, Minnesota and Ontario; together with a general statement of the water levels, interests involved and methods of relief. By Charles A. Magrath and James A. Tawney members of the International Joint Commission, presented by Mr. Nelson, June 20, 1916, Senate Document No. 467, 64th Congress, 1st Session, Washington, 1916, 10 pp.

Representations are repeatedly being made by the United States authorities for the conservation of their own coal. Dr. George Otis Smith, Director of the United States Geological Survey, in 1916, publicly stated:

"Of the two fuels that can be considered as the competitors of water in power generation, petroleum has probably already passed its maximum of production, and the life of this source of power is to be measured by only a few decades. The coal resources of this country, on the other hand, are so large as to promise an abundance of fuel for scores of generations. Yet the price of steam coal shows a steady advance, offset, it is true, by increased efficiency in steam generation and utilization, but eventually the relative importance of water-power the country over must increase.

"Already the great development of hydro-electric power in California in competition with oil and in Montana in competition with coal, forecasts the future relation of industry to this source of power. In these and adjoining states irrigation and mining and transportation depend in larger measure each year upon hydro-electric energy, and it is because of this increasing contribution to the industrial life of the nation that public service and public utilities are more than names when applied to the utilization of water-power."

The United States is well aware of the economic importance of its coal reserves. Dr. Smith, further, states:

"Cheap power promises to be, in some future century, this country's largest asset in the industrial rivalry among nations. Our unsurpassed coal reserves, reinforced by these water-power resources, constitute a strong line of national defence, in that they form the real basis for an industrial organization of the nation's workers. It is only through abundant and well-distributed power that the other material resources of the country can be put to their highest use and made to count most in the nation's development. The people's interest in water-power is greatest in its promise of future social progress, and such an interest is well worth protecting."

Ten years ago, the Committee on Rivers and Harbors of the United States House of Representatives directed special attention to the industrial value of Niagara falls, and the importance of this power supply when considered in connection with the supply of coal. It was urged that the chief and most important procedure for improving the power conditions were: First, the utilization of every American water-power to its fullest extent; second, a more general location of manufacturers close to sources of fuel supply; and third, the adoption of highly economical steam-driven power plants and more efficient methods of distributing and utilizing the energy. In his statement to this committee Mr. W. J. Clark said:

"The enormous advantage which would accrue from the adoption of these last two suggestions will, however, be neutralized in a comparatively few years if some effort is not made to preserve the coal supply of America.

"This feature is so important and has so great a bearing upon the question at issue it is considered proper to directly consider it herein.

"It would be unfair to place the responsibility for the rapidly increasing use of coal in the United States, which threatens the ultimate exhaustion of the supply, entirely upon the manufacturing industries, for its consumption for transportation and other purposes has increased even more rapidly than for manufacturing uses. Attention should, however, be called to the leaps and bounds with which American coal production is increasing, so that the importance may be realized of preserving the supply by, so far as is practical, utilizing water-power for all industrial purposes."

And again it will be recalled that, a few years ago, the Director of the U. S. Geological Survey, in referring to the world's coal supplies, stated:

"This glance at the world's reserves of coal shows plainly, not only that the United States leads all other countries in production, our annual output being nearly 40 per cent of the total, but also that it possesses the greatest reserves. Yet in respect to no mineral is there greater need to emphasize the folly of exporting the raw material. Let us keep our coal at home, and with it manufacture whatever the world needs."

In November, 1916, during the coal shortage in the United States, in the course of the investigation into the alleged coal combine, held at Buffalo on November 28, the District Attorney in charge of the investigation put this question to one of the witnesses:

"If the Canadians put an embargo on power when there is a power shortage, should we not put an embargo on their getting coal when there is a shortage here?"

In other words, he suggested that, if citizens of Canada demand that electrical energy generated in Canada be used exclusively for citizens in Canada and that its export to the United States be prohibited, then are not citizens of the United States equally justified in contending against the export of coal to Canada, because it is needed for citizens in their own country?

The propositions thus succinctly suggested by these statements of the Director of the United States Geological Survey and of the Buffalo District Attorney, may well be pondered by the citizens of Canada.

Good Working Basis Practicable	No country need be expected to send out of its borders that which is essential to its own existence.* Between the United States and Canada there is exchange of many natural and manufactured products, and no doubt the problems which are sure to arise in connection with such interchange—including the commodities of fuel and power—can be reduced to a good working basis.
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The public press could render valuable assistance in these matters. Well directed articles, from time to time, have appeared in many papers, but as the statements made and quantities mentioned have frequently been inaccurate, the articles have lost much of the force and educative influence they might otherwise have possessed.

Everyone familiar with the course of events which preceded the ratification of the Boundary Waters Treaty of 1910 knows that, under the prior—but since lapsed—Burton Act, it was anticipated that some of the electrical energy developed in Canada would be exported to the United States. In fact, it was, by some, believed that it would not be possible to utilize in Canada more than a portion of the great amount of electrical energy that might be developed on her side of the boundary, and that, consequently, the United States market would import from Canada any surplus energy. These expectations have not materialized as was anticipated, because the growth of industries dependent upon electrical energy has been so phenomenal in both countries.

Recollecting that the *doctrine of equal benefits* is basic to the Boundary Waters Treaty, each country should watch to see that no purely selfish interests shall operate to work any injustice to the other country. For example, after all factors have been duly weighed, if it is found that any *bona fides* exist which require the exportation of an amount of electrical energy to the United States in order to enable that country to derive the beneficial use from its equity in boundary waters, such *bona fides* should be fully respected.

United States Fears Canadian Markets may Absorb Electricity	To perceive how the present acute condition respecting Niagara power has arisen, it is well to consider statements upon the subject made by prominent authorities. Although, on a former occasion, reference has been made to the views of authorities in the United States, yet it will be profitable here to review some of these.
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* For comments upon the application of this doctrine to the exportation of phosphate rock and other commodities, consult an article by Arthur V. White on the "Exportation of Electricity," which appeared in the *University Magazine*, October, 1910, pages 460 *et seq.* Consult, also, *Toronto World*, 18th March, 1912; Also, "Exportation of Electricity—An International Problem," in the *Monetary Times*, of January 5th, 1917, pages 21 *et seq.* Consult, also, *Annual Reports of Commission of Conservation*, Ottawa.

Those in the United States who have watched the increasing demand for electric power in their own country have also observed that there has been an increasing demand for electric power in Canada. As just stated, it was by some thought that the Canadian markets could not absorb the large quantity of electric energy generated in Canada. The course of events, however, is proving the contrary to be the case. Those interested in power consumption in the United States have not hesitated to express the fear there entertained, viz., that Canada, on account of her growing manufactures and demands, would rapidly absorb the electric energy which has been so much coveted for importation into the United States.

The following confirmatory testimony will demonstrate the views thus entertained. Lieut.-Col. J. C. Sanford, reporting on January 6, 1913, upon the subject of Niagara power, to the Chief of Engineers, United States army, states:

"There is no question but that Niagara power will soon be utilized to the fullest extent allowed by governmental restrictions. If advantage of the power generated in Canada cannot be had on the American side, manufacturers will be attracted to Canada by this cheap power, and the industries of this country will suffer accordingly. The effect of present restrictions on the importation of power is becoming noticeable..... Manufacturers at present contracting for additional Niagara power must locate, and are locating, in Canada. It, therefore, seems advisable to permit immediately the importation of Niagara power to the fullest extent permissible under the law, and, other things being equal, to grant permission for its importation to the company or companies which will make the earliest use of such power."

The former Secretary of War, Hon. Henry L. Stimson, before the Committee on Foreign Affairs, recently stated that:

"The investigation which has been made by the engineers indicates that Canada, if we do not take it, will use the entire amount that the treaty permits in a very brief time, so that whatever effect any restrictions on importations would have, would not protect the falls for more than a very brief period, and it would result in giving to Canada, very possibly, a large number of industries which otherwise would be established on this side of the falls."

When Representative Charles B. Smith was speaking on behalf of his bill, he submitted, before the Committee on Foreign Affairs, a letter from a leading citizen of Buffalo, in which it is stated:

"Every restriction on the importation of Canadian power should be at once removed. Electrical power is a *raw material and should be free.*"

The sub-committee on Niagara Falls power, appointed by the Committee on Foreign Affairs, in their report on one of the Cline bills, state that it had been urged for their attention:

"That the Canadian companies were rapidly increasing their sales and would very soon take the full amount of water they were entitled to and the United States ought to get what power it was able to *now*."

and they add:

"If the advancement in the development of power on the Canadian side increases for another year or so—and it is not apparent to the Committee that it will not—then the Committee concluded that it was proper to take as large an amount as it could get for consumption in the villages, cities, factories and homes along our border."

Representative Charles B. Smith, of the state of New York, in conversation, stated to me, that he favoured no restriction on the importation of electricity, because, if it was good for the United States to have this commodity, he thought it was advisable to get as much as possible, and permit it to come into the country without any restriction. This view of Mr. Smith is amply reflected in certain bills of his which provide for no restriction.

In the state of New York there is a ready market for additional electric energy. The Opinion, delivered on February 12, 1914, by the Public Service Commission of the state of New York, states:

"That there is a large shortage of electric power in western New York with a strong demand for greater supply which is not being met by existing companies. We are using all the power made on the New York side, and all that has been brought from Canada, and the demand for more power in western New York is insistent and being urged with great force."

It is also stated that Niagara Falls power produced in the United States is so far from supplying the needs of portions of the state of New York, that, if the importation of power were prohibited, it "would plainly amount to a great public calamity."

With such views as these being widely held in the United States, various public organizations were prompted to take public action.

The Secretary of War exercises jurisdiction over the Niagara river, and, through the agency of the U. S. Engineers, the War Dept. has kept in close touch with the Niagara situation. The restraint which this department has enforced upon the power companies, in order to keep them within treaty requirements, as well as within regulations of a domestic nature, is worthy of best commendation.

Public Meetings
in United States
re Niagara
Power

In August last, the War Department issued notice of public hearings to be held at Niagara Falls, N. Y., for the purpose of ascertaining what industries dependent upon power generated from the waters of the Niagara river at Niagara Falls, have been, or are likely to be, adversely affected by a reduction of power obtained by them from that source. Blank forms, for supplying information, were also distributed to various companies. The report, I understand, has not yet been made public.

The Water Power Investigating Committee appointed by the New York State Legislature, under the chairmanship of Senator George F. Thompson, has held hearings at Niagara Falls, N. Y., and elsewhere, and it is understood that this committee is about to issue a report dealing with Niagara power.

The Hydro-Electric Association of Buffalo, N. Y.—an organization seeking to carry out a plan for power distribution modelled after that of the Ontario Hydro-Electric Power Commission—has been urging before the Committee on Foreign Affairs their claim to the unappropriated 4,400 cubic feet of water per second.

Two of the most important recent meetings were those held by the Committee on Foreign Affairs of the U. S. House of Representatives at Niagara Falls, N. Y., on July 13, 1916, and at Washington, D. C., on August 1, 1916.

Public Meetings
held by U.S.
Committee on
Foreign Affairs

At the July meeting, the Committee was addressed by prominent persons utilizing Niagara power, such as the managers, superintendents, and consulting engineers of such concerns as the Graphite Company, the Union Carbide Company and the chlorine industries. All speakers emphasized the fact that they were experiencing acute shortage of power. There were about one hundred representatives present. Some of the speakers drew attention to the handicap experienced throughout the United States at large, owing to the fact that many industries had been deprived of their usual supply of dye materials from Germany. It was instanced that, before the war, the country, as a whole, was not specially concerned about dye products, and, outside of those immediately concerned in this branch of industry, but few persons had any idea where dye materials were obtained. After the commencement of war, however, when the supply of dyes was cut off, and branches of industry had to be shut down or curtail output, when prices advanced, and, when goods with inferior dyes were being marketed, the general public began to appreciate the fact that their every-day interests had been seriously interfered with.



FLOOD CONDITIONS ON LAKE OF THE WOODS, SPRING, 1916

Typical flooding of private boathouse and dock.



FLOOD CONDITIONS ON LAKE OF THE WOODS, SPRING, 1916.

Government dock submerged, Kenora, Ont. Note boy standing by boat on dock.

Directing attention to the effects of the dye shortage, speakers emphasized that the United States was many times more dependent—even though they did not know it—upon products resulting from the use of Niagara power than they ever were on the dye-producing industries of Germany. Speakers went on to demonstrate that it was utterly futile for the United States to devise and attempt to carry out any policy of war-preparedness, without, at the same time, augmenting the power available for the use of United States industries now located at Niagara. It was emphasized that this applies specially to plants manufacturing such products as chromium, utilized for the steel for battleships and for highspeed cutting tools, which latter have so materially increased the output of metal-working establishments. They also pointed out the need for increasing the output of the abrasive industries, which supply carborundum and other products, now so generally employed in the modern grinding processes, which, to a large extent, have superseded, for many purposes, the work previously performed by lathe and other machine tools. Much attention was directed to the graphite products, without the supply of which it would be simply impossible to produce the materials from which to manufacture many of the modern munitions of war.

The statements made by the various speakers, in order to demonstrate the shortage of power, were convincing and favourably impressed those present, including the members of the Committee on Foreign Affairs.

At this meeting statements were made to show that the United States, in order to conserve and advance her industrial position in the world markets, could not afford to permit industries to locate in other countries where cheap power was being offered. Instances were mentioned, such as that of the Union Carbide Co. locating in Norway, in order to have available 100,000 h. p.; also a case in Canada, where the American Cyanamid Co. had been forced to move out of the United States and locate in Canada near Niagara Falls, in order to obtain a block of some 25,000 or 30,000 h. p. Such instances were cited to demonstrate that it would be extremely unfortunate to the upbuilding of the United States if industries had thus to expatriate themselves because the additional power necessary for their growth could only be obtained abroad.

At the August hearing before the Committee on Foreign Affairs, representations were made by the Hydro-Electric Association of Buffalo, N. Y.; by the Hydro-Electric Association of Niagara Falls, N. Y.; by members of the New York Joint Committee of the Senate and Assembly appointed to investigate the water-power situation

in the state of New York, and by other interests. All who appeared again emphasized the power shortage, and special attention was directed to the operations of the Hydro-Electric Power Commission of Ontario, and to the growing industrial development and power demands in Canada.

After its August meeting, the Committee announced that the hearings just held "furnished the Committee with all information it required in order to proceed to 'report out' the Cline Bill." I understand that, since the presidential election, no further action has been taken.

To relieve the acute power situation in New York state, the U.S. War Department has issued provisional and temporary permits, both to the Hydraulic Power Co. and to the Niagara Falls Power Co., to utilize temporarily, during the winter months, a portion of the 4,400 c. f. s. remaining unappropriated under the Boundary Waters Treaty.*

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO AND THE POWER SHORTAGE IN CANADA

In the first place it may be stated that all the power producing resources of the Niagara power companies in Canada are taxed to their respective limits. Secondly, there is no doubt that the use of electricity in Ontario has been greatly stimulated by reason of the activities of the Ontario Hydro-Electric Power Commission. Rates have been lowered.

The Commission at present is directing the following hydro-electric systems: Niagara, Severn, Wasdell Falls, St. Lawrence, Ottawa, Port Arthur, Eugenia, Muskoka, Northern Ontario and the Central Ontario.

On March 10, 1916, the Ontario Government purchased the Central Ontario system, for the sum of \$8,350,000. This comprises the entire holdings of the Electric Power Company, which embrace twenty-two subsidiary companies, including transmission lines of 285 miles at 44,000 volts.

The Niagara system embraces all municipalities supplied with power from Niagara falls, which power is purchased from the Ontario Power Company and the Canadian Niagara Power Company. In Niagara district, exclusive of some twenty or more rural townships which it supplies with electric energy, the Hydro-Electric Com-

* Since the foregoing was written the U.S. War Dept. has granted permits for the unappropriated 4,400 c. f. s.

mission is furnishing power and light to over 110 municipalities. To show the increasingly great demand for power in Canada, it may be stated that, during 1916, *for industrial purposes, in the Niagara territory alone*, the Commission received *bona fide* applications for over 70,000 h. p. These applications came from such companies as the American Dye and Chemical Co., Electro-Chemical Co., Canadian Carbide Co., Norton Emery Co., Carborundum Co., Riordon Pulp and Paper Co., Beaver Paper and Wood Co., and many others. For the most part, it has been simply impossible to supply such demands. The Commission has exclusively furnished electric power to approximately 300 plants making munitions of war.

Some idea of the growth of the Commission's operations, in its Niagara system, may be judged from the following figures, which show the yearly loads to take care only of municipalities in the Niagara territory, together with a few special industrial contracts which were made for long term periods.

This table does not include any estimates for meeting such requests for power for special industries as those indicated as having been applied for in 1916.

Yearly Loads on the Niagara system:

1911.....	12,000	horse-power
1912.....	28,700	"
1913.....	50,470	"
1914.....	82,161	"
1915.....	110,654	"
1916 (estimated).....	150,000	"
1917 (estimated).....	205,000	"
1918 (estimated).....	250,000	"

The present situation vindicates—if vindication were necessary—the strong stand taken by the Commission of Conservation in its protest of February 7th, 1910,* against the Long Sault application. The Commission said:

"Should the time come when further power is demanded by Canadian interests, and the placing of a dam across the St. Lawrence river is determined upon, one-half of the power to be generated thereby will belong of right to Canada, and should be permanently retained for Canadian use without any exception or qualification.

"The suggestion that power can be generated on the American side, or generated on the Canadian side and exported to the United States, and that thereafter, when it is required in Canada, the company can be ordered to deprive its United States customers of the power and deliver it in Canada, is regarded as being entirely illusory. If the power is used in the United States, industries will be built

* *Long Sault Rapids, St. Lawrence River.* By Arthur V. White, Commission of Conservation, 1913; p. 326.

up and vested interests created thereby, which it will be impossible to ignore. The attempt to enforce an order for the delivery of power on the Canadian side after it had for years been exported to, or used in, the United States, would lead to serious difficulties. The case is not the same as if the company and its works were wholly within Canada. If the company desired to avoid or resist such an order, no means would exist of enforcing it without resorting to steps which would be a sure road to international complications."

The Ontario Hydro-Electric Commission has stated that, in 1917, to meet the natural growth of its municipalities only, it will require, from the Niagara companies, some 50,000 h. p. additional. Of the power which the Commission has been receiving from these companies, only about 10,000 h. p. has been derived from energy which was formerly exported. In other words; the additional supply of power from Canadian companies to the Commission has been met by the installation of additional units.

This great demand for power in Canada will be met, chiefly, in two ways; first, the more immediate needs will be supplied from the existing power plants at Niagara on the Canadian side; second, by means of the proposed Chippewa development of the Hydro-Electric Commission, which will provide about 200,000 h. p. under a head of 300 to 305 feet. Construction work on this project has temporarily been delayed pending an adjustment of certain international considerations in connection therewith.

A large number of the municipalities in the southwestern portion of the province, alive to the need for having more power available, were asked by the Hydro-Electric Power Commission of Ontario to pass upon the question of going ahead with preparations for the Chippewa hydro-electric development project. All but two of the municipalities voted favourably.

On January 1, 1917, the electors of the municipalities constituting the Niagara system approved, by a large majority, the following question:

"Are you in favour of having the municipality develop or acquire through the Hydro-Electric Power Commission of Ontario whatever works may be required for the supply of electrical energy or power in addition to such electric power as is already obtained under the existing contract with the Hydro-Electric Power Commission of Ontario?"

Although this question, evidently, is framed with the object of aiding the municipalities interested, by working co-operatively through the agency of the Hydro-Electric Commission, to further the Chippewa project, yet it may be perceived that the question, as worded, also has in view the enabling of the municipalities to develop or acquire other sources of power.

Having in mind the coal question, we have now dealt with the Niagara situation, and such statements as have been presented must emphasize the importance to Canada of this national and international fuel and power situation. The problems call for the best statesmanship which Canada can bring to bear upon their solution. A knowledge of all facts relating to the subject should be at hand, and understood. Only in this way can a wise administrative policy respecting hydro-electric power development at Niagara be formulated and carried out.

Canadian Power Plants at Niagara Falls It will be profitable to consider the outputs of the existing power plants at Niagara. The information respecting the three large power plants in Canada at Niagara Falls may briefly be summarized as follows:

Canadian Niagara Power Company

5 generators, rated at 10,000 horse-power each.....	50,000 h.p.
5 generators, rated at 12,500 horse-power each.....	62,500 h.p.
Total.....	112,500 h.p.

Space has been provided for an eleventh, or spare, unit. Up to March, 1917, with ten machines installed, having a rating capacity of 112,500 h. p., the company showed a maximum generation of approximately 100,000 horse-power.

Ontario Power Company

3 generators, rated at 10,000 horse-power each.....	30,000 h.p.
4 generators, rated at 12,000 horse-power each.....	48,000 h.p.
7 generators, rated at 13,000 horse-power each.....	91,000 h.p.
Total.....	169,000 h.p.

The hydraulic installation comprises two 18-foot main conduits. A proposed third conduit has not been installed. The total maximum output has reached a little over 163,000 horse-power.

Electrical Development Company

4 generators, rated at 10,500 horse-power each.....	42,000 h.p.
7 generators, rated at 13,400 horse-power each.....	93,800 h.p.
Total.....	135,800 h.p.

It will be observed that the installation of the Electrical Development Company exceeds its agreed 125,000 horse-power.

With respect to the exportation of electrical energy from Canada to the United States, the Canadian licenses for 1915 provided for the following:

	Approximate kilowatts	Approximate horse-power
Electrical Development Company (Toronto Power Co.).....	35,000	47,000
Ontario Power Company.....	45,000	60,000
Canadian Niagara Power Company....	55,000	74,000
Total.....	135,000	181,000

The Canadian Government has had under consideration a proposal to reduce the export quantities to the following:

	Horse-power
Electrical Development Company.....	16,000
Ontario Power Company.....	60,000
Canadian Niagara Power Company.....	40,000
Total.....	116,000

On the United States side the Hydraulic Power Company of Niagara Falls has remodelled its plant. It has two power houses jointly capable of developing about 158,000 h. p.

The Niagara Falls Power Company has an installation capable of developing 100,000 h. p., but the amount of water apportioned this company by the War Department permitted only the development—according to various combinations of units—of from about 65,000 h. p. to 80,000 h. p. It has been stated that, under a temporary permit from the War Department, an additional 25,000 h. p. is permitted during the winter months. Water for this extra power is made available from the unappropriated 4,400 c. f. s.

BRITISH COLUMBIA WATER POWER REPORT

From the foregoing discussion we have seen how, during the past year, a number of important questions have arisen demanding special attention. My presence at the various meetings, court proceedings, etc., above referred to, including the heavy work connected with the International Joint Commission, has consumed much time. Notwithstanding these circumstances, very good progress has been made in connection with the report relating to the water-powers of British Columbia.

Report of Committee on Waters and Water Powers

BY

LEO G. DENIS

Hydro-Electric Engineer, Commission of Conservation

DURING the year two important reports were published under the direction of the Committee on Waters and Water-powers, namely the reports on the *Waterworks and Sewerage Systems of Canada* and the *Water Powers of Manitoba, Saskatchewan and Alberta*.

The report on *Waterworks and Sewerage Systems* is the second edition of this publication, and includes much more detailed and extensive data than the first. The main portion of the report is devoted to physical and financial data of all waterworks and sewerage systems of the Dominion. There are, in addition, a number of tables, summarizing the most salient points extracted from the information contained in the body of the report. Thus, some 528 waterworks and 279 sewerage systems are described in as much detail as space would allow, while the tables reveal data, throwing light on the importance of these systems in Canada. For instance, the 528 waterworks plants represent a capital outlay of nearly \$124,000,000, while the 279 sewerage systems have cost over \$77,000,000.

Water filtration is being used in connection with many of our domestic water supplies, but not as generally as might be expected; for instance, out of 216 systems obtaining their supply from possibly polluted sources, we find that only 72 have adopted filtration. Most of the unfiltered systems disinfect the supply with hypochlorite, or similar treatment, but this cannot be considered satisfactory, except as a precautionary measure pending installation of filtration. The importance of the gravity system, where the supply is obtained from distant lakes or streams, is also to be noted. There are over one hundred of these systems; among the larger cities thus supplied are Halifax, St. John, N.B., Quebec, Fort William, Calgary, Victoria, Vancouver, and New Westminster, while Winnipeg will also soon be included.

Excessive Water Consumption

Excessive water consumption in most of our cities is another important point. The average daily consumption is 111 gallons per capita, while individual centres of fairly large size reach as high as 292 gallons. These figures could unquestionably be lowered; in many municipalities in Great Britain the consumption is as low as 25 gallons, and in but few is it more than 70 gallons per capita.

As stated in the first edition of this report, the pollution of our inland waters by untreated sewage is becoming a serious problem. More than 60 of our inland water systems receive sewage without the least attempt being made to prevent it spreading disease; 180 municipalities contribute to this very undesirable state of affairs. It is to be noted, however, that conditions in this respect are rapidly improving, particularly in the western portions of the Dominion. New sewerage systems have either been constructed with treatment plants, or are being designed and installed with a view to having treatment plants added in the near future, at the minimum expense.

The report on *Water Powers of Manitoba, Saskatchewan and Alberta* was published during the latter part of the year, its publication having been delayed to allow of the inclusion of later data which had become available, thus adding greatly to the value of the report, and bringing it up to date. This additional information was obtained principally through the Water Power and Irrigation branches of the Department of the Interior, the organizations charged with the administration of water power and irrigation, respectively, in the Prairie Provinces.

The report contains a complete compendium of all available information on the subject and will prove most useful as a reference book, especially to anyone contemplating the development of, or who is, otherwise, interested in, water-powers in this portion of the Dominion. An important fact brought out is that, while portions of the territory in the south are deficient in water-powers, the northern portions abound in this very desirable natural resource, and the information contained in this report should correct the erroneous opinion sometimes expressed that similar conditions obtain in the north as are found in some of the better known portions of the provinces.

With the publication of the report, now in press, by Mr. A. V. White, on *Water Powers of British Columbia*, complete preliminary information on the importance and possibilities of even our remotest water-powers will have become available, while, from accompanying maps, the position of each power may be ascertained. This survey

was of great importance, one of its principal objects being to pave the way to further and more detailed investigations of these natural resources.

In this connection it is gratifying to note that the measures which the Commission of Conversation has consistently urged since its creation, relative to the disposal of water-powers by the Crown, to stream flow and to other investigations regarding them, are enforced and being practised in almost every province.

Nova Scotia, in 1914, appointed the Nova Scotia Water-Power Commission, with power to make regulations regarding the disposal and administration of water-powers. The commission has been very active during the past two years in systematic investigations of detailed power possibilities and in the establishment of stream gauging stations, this work being carried on in co-operation with the Dominion Water Power branch, Dept. of Interior.

It is expected that similar action will shortly be taken by New Brunswick.

In Quebec the government has two organizations working in co-operation in connection with its water-powers. The Hydraulic Branch of the Department of Lands and Forests has charge of leasing and administering them, while the Quebec Streams Commission, organized in 1912, is actively pursuing water-power investigations and undertaking important conservation storage projects, such as at La Loutre, on the St. Maurice, the third largest in the world, as well as on the St. Francis and other rivers. Regulations for the disposal of water-powers in Quebec are now adequate, and the emphyeutic, or conditional long term, license given for periods of from 25 to 99 years, assures development within a limited time under government supervision and provides for a fair remuneration to the Crown, thus encouraging bona fide projects.

Ontario was one of the first provinces to undertake proper regulation and administration of its water-powers. The administration, which comes under the jurisdiction of the Minister of Lands, Forests and Mines, as well as investigations in connection with these, is in the hands of the Hydro-Electric Power Commission of Ontario, created in 1906, and the regulations for granting water-power privileges embody strict conditions, limiting licenses to 20 years, and provide for approval of plans, also government supervision of development, which must be completed within a limited time and, if necessary, later, extended to satisfy public demand. This Commission is very active in its investigations regarding undeveloped power, and, according to its last report, has 69 regular stream measurement stations and many other temporary ones.

Besides this work, the Hydro-Electric Power Commission has followed its primary object with excellent results, namely, to serve as a medium, both physically and otherwise, between interests generating hydro-electric energy and the users or municipalities. Upward of 200 of the latter are now supplied with electric energy through the Commission, for which purpose, extensive electric transmission lines have been constructed.

In the Prairie Provinces, water-powers are under Federal control, and the Dept. of Interior both administers and conducts investigations in connection with these. All water-powers are licensed for a term of 21 years, which is renewable for three further similar periods with certain re-adjustments, while development within specified time is provided for and further assured by having an agreement for the period of construction and granting the license proper only after completion of work to the satisfaction of the Minister. Investigation work, surveys and explorations are being pursued in connection with the northern water-powers, while detailed surveys of some of the large rivers in the south have permitted elaborate plans and estimates to be prepared in connection with possible water-power development. Numerous stream measurement stations have been established, and surveys and other investigations in connection with irrigation are also included.

The water-powers of British Columbia are under the control of the Provincial Department of Lands, through its Water Rights branch, and are administered under the Water Act of 1914. The latter provides for the disposal of water-powers by license, with fair annual rental, the latter being re-adjusted every five years, also, for the approval of plans and the completion of works within limited time. The Water Rights branch also pursues systematic investigations and reconnaissance surveys. The more accessible portions of the province are being thoroughly covered, while upward of 200 regular stream measurement stations have been established in connection with the work.

This work should be further encouraged and extended, as the proper and intelligent disposal, administration, utilization and conservation of our water-powers can only be expected after thorough investigations and surveys, which should be undertaken by the various government organizations interested, and not left to private parties, as has often been the case in the past.

Stream Flow and Level Variation	A commencement has been made at collecting stream flow and level variation. These data, which are otherwise not available, are mostly being obtained by correspondence with operating hydraulic plants, or
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with private parties. The province of Quebec has practically all been covered, and the results are very encouraging. The correspondents appreciate the value of the work, and companies and individuals keeping records have willingly gone to considerable trouble to supply the desired information, while others have expressed a wish to co-operate in keeping future records. In this connection, studies of the flow of the St. Lawrence river were also undertaken and have progressed satisfactorily.

As an outcome of the power survey recently undertaken by the Commission, it has been found advisable to obtain additional and more detailed descriptive information, respecting the electric power plants throughout the Dominion. The importance which electric energy has at present, and, in the near future, will have in the industrial development of Canada is appreciated. While this is particularly true of hydro-electric energy, steam, gas and oil operated electric plants also offer special interest with regard to power conditions. These latter plants are usually of large size, and, as the question of economical production of power is the principal item, they can usually be taken as a criterion, so far as power conditions are concerned. The additional data are being obtained by correspondence, and, when complete, will prove of much value.

Many articles and short reports have been supplied during the year, either on our own initiative, or in answer to special requests. The various subjects include summary reports on the water-powers of the province of Quebec and of the Prairie Provinces, developed and undeveloped water-powers in Canada, water-power regulations, water-power conditions at Sault Ste. Marie, water supply and sewerage situation in Canada, floods, electric heating and the industrial importance of our water-powers.

Shortage of Power

One of the most important considerations in many portions of the Dominion during the past year has been that of need of additional power. This has been particularly emphasized in the Niagara district, where the principal cause may be attributed to the enormous quantity exported. Other indications are the permission for the full diversion of the St. Mary river (Sault Ste. Marie) at its minimum flow and the recent statement of one of the officials of the Shawinigan Company which supplies power to Montreal from its plant on the St. Maurice, that they were taxed to their full extent, with heavier demands still being made. In the above, as well as in other cases which could be cited, it is noteworthy that, where the supply is not equal to the demand, this condition has usually been brought about, not through actual lack of water-power, but more frequently through

the improper timing of improvements, extensions and new developments; instead of keeping ahead of the demand, the hydro-electric companies have allowed themselves to be overtaken by it. The large amount of power required by munition factories is an important factor in the increased requirements, but other industries are also large buyers of energy.

Water
Diversion

Closely allied with the power shortage at Niagara, as well as at all water-powers of the St. Lawrence, is the question of water diversion through the Chicago Sanitary canal. One feature, which has perhaps not been sufficiently emphasized in connection with this scheme, has been forcibly brought out in recently published figures respecting the power plant, which evidently is a very important factor of the project. The figures show that the disposal of sewage is only a secondary consideration, when compared with the financial aspect of the hydro-electric power development. This is further accentuated by the fact that the estimated profits from the extensions now under construction would be about 100 per cent. Figures showing the growth of the power plant give 15,278 h.p., with earnings of \$130,936 for the year 1908, while, in 1915, these figures had reached 55,640 h.p. and \$932,566, respectively. Although the authorized diversion is but 4,167 cubic feet per second, it is notorious that about 8,000 cubic feet per second is actually flowing through the Chicago river.

Report of Committee on Fisheries, Game and Fur Bearing Animals

BY

OLIVER MASTER

Assistant Secretary, Commission of Conservation

DISTINCT progress can be reported in connection with the efforts of the Commission to promote more efficient protection and utilization of Canada's resources in fisheries, game and fur-bearing animals.

Utilization of Fisheries Waste

With regard to the fisheries branch of the committee's activities, the chief undertaking of the past year has been the series of experiments conducted to ascertain the possibility of securing profitable utilization of the immense quantities of waste material which characterize practically every branch of the fishing industry. This investigation has been carried out under the direction of Mr. J. B. Feilding, whose progress report has already been presented. Its importance may be judged by the magnitude of the waste which it seeks to eliminate. In investigations on the Pacific coast, the sheer waste of the fisheries of Alaska has been estimated at 70,000 tons per annum, and of those of British Columbia at from 15,000 to 20,000 tons. The Canadian lobster canning industry is also characterized by enormous amounts of offal. Mr. R. H. Williams, of Halifax, makes the startling assertion that an average season's pack of 160,000 cases requires 32,000,000 pounds of lobsters, of which only 6,500,000 pounds are used and 25,500,000 pounds are absolutely wasted. In other words, the lobster industry, as now conducted, utilizes but twenty per cent of the raw material. Even under these conditions, the annual value of the lobster industry to the Dominion normally exceeds \$4,000,000. From the foregoing figures it will readily be appreciated that few industrial improvements could render more substantial aid to the fishing interests than the perfection of practicable methods of converting the offal to economic use. It is anticipated that Mr. Feilding's experiments will prove of material service in solving the problem.

General Condition of Fishing Industry

In view of the urgent necessity for securing from every branch of husbandry its maximum contribution to the national food supply, as thorough a statistical study as circumstances permitted has been made during the past

year of the recent progress of the fishing industry as a whole. For the year ending March 31st, 1916, the value of the output of Canadian fisheries attained the record aggregate of \$35,860,708. It is a matter for serious consideration, however, that the actual food production of the fisheries of the Dominion has increased much less rapidly than the monetary returns to the fishing interests. Owing to the striking rise in prices since 1900, the value statistics are extremely deceptive and furnish no reliable indication of the real progress of the industry. Taking eleven principal fish products, an examination of the official figures reveals a steady increase in the value of the annual catch, which we have been accustomed to regard as a proof of industrial expansion. In reality, these value increases are almost entirely due to the rise in prices and only, to a negligible degree, if at all, the result of increased production. Of the sea coast provinces, British Columbia, alone, appears to have achieved any substantial progress in food output from the fisheries. From 1900 to 1913 the value of the catch of eleven principal species for the entire Dominion increased by nearly seventy per cent. Despite the failure, during that period, to achieve any appreciable advance in the volume of the catch, several of the most valuable individual fisheries have been, or are, seriously threatened with depletion.

National exigencies demand, for the immediate future especially, that the greatest possible food output be secured from our fisheries, and the unprecedented prices now prevailing may be relied upon to stimulate production to the maximum. British markets require all the fish that Canada can export, and varieties hitherto neglected are in steady demand. Although it is almost inevitable that existing conservation problems will be accentuated, it would hardly be advisable to restrict exploitation in any way until the successful conclusion of the war. On the contrary, every encouragement to production should be extended. In the meantime, preparation should be made to enforce, as soon as feasible, adequate measures for the preservation of fisheries, such as the halibut, which are unmistakably in process of depletion, as well as to stimulate exploitation of fisheries which, fully utilized, could contribute vast increases to the annual production from this branch of primary industry.

Preservation of
Halibut and
Salmon

During the past year, the preservation of two of our most valuable fisheries—the Pacific halibut and salmon—has occasioned international concern. In

both instances, the solution depends upon co-operation between Canada and the United States. It will be remembered that the situation with regard to the halibut was thoroughly dealt with in a

paper contributed by Mr. W. F. Thompson to the proceedings of the last annual meeting of this Commission. Legislation has since been passed by the United States Congress with a view to preventing over-fishing. Until Canada enacts restrictions of similar effect, however, this bill remains inoperative. If the method of protection initiated by the United States does not appear satisfactory, every effort should be made to conclude such other arrangement as may be deemed adequate and proper.

The evidence of Mr. H. Bell-Irving, before the Dominions Royal Commission, at its session in Vancouver last September, furnishes authoritative testimony respecting the condition of the salmon fishery of the Fraser river and Puget sound. The statement of Mr. Bell-Irving, acting as spokesman for the British Columbia canners, was, in part, as follows:

"I would urge, very strongly, indeed, that there should be a Royal Commission appointed to examine into the whole question of the British Columbia fisheries; that, pending the report of that commission, no new canneries should be permitted to be built on the main fishing rivers of British Columbia; and further, that for the years 1918, 1919 and 1920 the Fraser river be closed entirely to fishing, in order to allow it to recuperate.

"The Fraser river, at one time, was considered a great national asset of Canada in its production of salmon. At the present time it is practically a thing of the past. There were thirteen canneries in the old days when I went into it first. There are now about fifty, and the total pack, I am sorry to say, is not sufficient to keep one moderate sized cannery busy. That is the deplorable condition into which we have got, part of which is undoubtedly due to the want of an entire understanding of the conditions. There is serious danger of the fishing in the northern rivers following in the same way—there is a great danger of these rivers being overfished."

The foregoing statement indicates the necessity for effective measures to preserve the salmon fishery. Regarding the manner of protection, which must be international in scope, differences of opinion prevail. The degree of depletion will not be fully apparent until after next season, which will be a "big year" for the sockeye run, according to the four-year cycle. Action will be largely dependent upon the conditions revealed in 1917.

Position and Problems of the Fishing Industry	Attention should be drawn to the unsatisfactory position occupied by the fishing industry, as compared with other branches of primary production in Canada. Recent investigation shows that, in the period 1900-14, the basic
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industries, agriculture, mining, lumbering, water-power development, hunting and trapping, all recorded substantially increased production. Fishing, alone, failed to advance to any extent in quantity of output. This failure is not to be taken as indicating a total absence of progress. During the period under consideration, the fishing industry has undergone marked change, including considerable improvement in equipment. The advent of the motor boat has served to greatly increase fishing efficiency. The most prominent feature in the history of the fisheries in the last decade has been the very decided tendency towards development of the secondary enterprises, such as canning, in contrast to the primary operation of catching fish. Since 1905, the total number of fishermen has decreased by ten per cent, while the number of persons engaged in canneries and fish-houses has increased by ninety-five per cent. In 1905, fishermen comprised 86 per cent of all persons engaged in the fishing industry; in 1915, they formed only 73 per cent. The general rise in prices has been incomparably the greatest factor in enabling the fisheries to achieve steady increases in the value of the output despite the practically stationary volume of the catch, but the industrial tendency just noted has also contributed towards this result, through the production of a more finished and consequently higher priced article.

The development of the Canadian fishing industry to the extent warranted by our fisheries resources awaits and depends upon improvements in administration, production, distribution and in the cultivation of domestic demand. The present exceptional activity cannot be expected to survive the abnormal conditions to which it is due. In administration the primary problem is to prevent the depletion of our various waters, and we have only to glance over the history of our chief commercial fisheries to realize that efficient administration is the basic requirement to a flourishing fishing industry. Secondly, in the field of production, the most pressing reform is the provision of technical education for those engaged in fishermen's occupations. Leaders in the fishing industry clearly recognize the necessity for some system of practical instruction, such as has enabled the fishing interests of Japan, Scotland, Norway and other countries to forge ahead. Improvement in distribution methods is a third essential. One of the most striking conclusions, resulting from the investigation last spring by the Committee on Marine and Fisheries of the House of Commons into the spread in price of sea foods in Canada between the points of production and

consumption, was that consumers in Canadian centres pay approximately \$45,000,000 per annum for fish which is valued roundly at \$15,000,000 at the points of production. In other words, distribution costs twice as much as primary production. Steps have been taken, on the recommendation of the committee, to reduce this factor in the final cost.

Co-operation should not be overlooked as a means of effecting economies in both production and distribution. Its contribution to industrial efficiency has been especially notable in the various branches of agriculture. It has remained for Newfoundland to apply the co-operative principle on a large scale to the fisheries industry. The Fishermen's Protective Union of that colony, after an active career of only a few years, boasts a membership of over 23,000. The total population of the colony is only 240,000. Through the parent and subsidiary organizations the union conducts trading, export, publishing, electric development, and ship-building activities. Within a very short period it has become the most powerful organization in the history of Newfoundland. Beyond question the success of this union could be repeated in the solution of at least some of the economic problems of our fishing industry through co-operative action.

In this respect important work has already been accomplished, and great achievements may be anticipated in the future as a result of the efforts of the Canadian Fisheries Association, an organization which, though comparatively young in years, is growing very rapidly in influence. In solving industrial problems its work should prove a material addition to the excellent service performed by the Fisheries Branch of the Department of the Naval Service in promoting the proper utilization of Canada's fishery resources. The activities of the Fisheries Branch in stimulating the fishing industry cover an exceptionally wide range, including protective work, biological investigation, fish culture on a very extensive scale, and the solution of transportation and other marketing difficulties.

Migratory Bird Treaty

The past year has witnessed the successful conclusion of the Migratory Bird Treaty with the United States.

This treaty, which, in all stages of the negotiations, has been accorded the Commission's heartiest support, may truly be characterized as one of the most comprehensive measures for the protection of wild life ever undertaken. It is to be noted that the treaty does not affect the actual administration of the game laws of the various provinces. It aims solely to provide in Canada, as in the United States, the minimum of protection regarded as

essential to the permanent preservation of the migratory birds of North America. The four principal provisions are:—

(1) That no bird important to agriculture because of insect-destroying proclivities shall be shot at any time.

(2) That no open season on any species of game bird shall extend for a longer period than three and one-half months.

(3) That both countries shall so restrict open seasons on game birds as to prevent their being taken during the breeding season.

(4) That there shall be no shipment from one country to the other of birds which are taken contrary to law. Steps are now being taken to secure such amendments of the provincial Game Acts as are necessary to remove existing discrepancies and otherwise to bring them into conformity with the terms of the treaty.

Wild Life of the Northwest Territories Last year this Committee presented a recommendation covering the reforms requisite to afford adequate protection to the game and fur-bearing animals of the Northwest Territories. Representations were subsequently made to the proper authorities, but the desired reforms were postponed. More recent information has confirmed the urgency of the situation and the absolute necessity for prompt action. The Commission has renewed its representations, and it is hoped that adequate measures for the preservation of the game animals of the northern regions will very shortly be undertaken. It may be pointed out that the difficulties of checking the depletion of northern mammals are not confined to Canada. In September last, the United States Secretary of Agriculture issued amended regulations affording more rigorous protection to certain species in Alaska, including deer, moose, caribou, sheep and mountain goats.

Recent Provincial Legislation Practically every session of our Provincial Legislatures records amendments and improvements of game laws. It is particularly gratifying to note the steady progress towards greater restriction of the operations of the market hunter. At their last sessions, the Legislatures of Manitoba and Saskatchewan passed amendments almost entirely prohibiting the sale of game, while Ontario also instituted material reforms in the same direction. At the present session of the Quebec Legislature bills have been introduced to extend the prohibition of the sale of partridge from 1917 until 1920, as well as to eliminate the hunting of big game, deer, moose and caribou, with dogs. Elsewhere game protectionists are actively promoting the enactment of effective laws for the preservation of wild life.

**Fur-bearing
Animals and the
Fur Trade**

The chief obstacle in calculating the value of Canada's fur resources has been the absence of statistical data. It has been necessary, until recently, to depend almost entirely upon the export figures as indicating the annual production. Most of the provinces now require trappers and dealers to make a return to the government covering their operations, and, as soon as similar requirements are enforced throughout the Dominion, accurate statistics of fur output will be obtainable.

To a considerable extent the fur trade of the Dominion has recovered from its demoralized state of 1915. Since 1915, the fur trade of Canada and the United States has discovered that North America is a great buyer as well as a producer of furs, and Canadian trade has recovered greatly, as compared with 1915, although it has not regained its pre-war magnitude. The outstanding feature is that the bulk of the business is going through new channels. In 1914 Canada took 47.3 per cent of her fur imports from the United States and, in 1916, 88.3 per cent. In 1914, 38.4 per cent of our fur exports went to the United States; in 1916, 78 per cent. In the meantime, Canadian fur sales are becoming a more important factor. The largest sale on record in Canada was held in Montreal last autumn by the Hudson's Bay Company, when prices ranged materially higher than those realized at either New York or St. Louis.

**Fur-farming
Industry**

It has not been possible during the past year to devote much time to gathering information with respect to recent developments in the fur-farming industry. It would appear, however, that, in most instances, fox ranching has got down to a sound basis. From time to time sales of pelts at very remunerative prices are reported. Mr. Alfred Fraser, of the firm of C. M. Lampson & Co., of London, visited Prince Edward Island last autumn and was kind enough to furnish the following statement conveying his impressions:

"I spent some weeks during the month of October looking at several of the fox ranches in Prince Edward Island, and must say that, although I saw a good many ranches that, for various reasons, will probably end in failure, I was favorably impressed with the industry as a whole.

"My firm, Messrs. C. M. Lampson & Co., of London, have, for the past eighteen or twenty years, sold the skins of silver and black foxes bred on Prince Edward Island, with extremely satisfactory results to the shipper, and, since the outbreak of the war and the consequent collapse of the fox boom on the Island, I have sold a good many Island skins in this city [New York], in most cases receiving as good a price as for skins of similar grades of animals taken from wild foxes.

"I regret that I do not feel competent to make any suggestions respecting better care and better food for Prince Edward Island foxes, more especially as many of the better managed ranches seem to have satisfactorily solved these questions; but, it would seem to me that animals that are destined to be killed in the autumn for their skins, should have the run of large, well-shaded pens, probably from the early spring until the time they are killed, and not kept in small uncomfortable pens, such as I saw on many of the ranches during my visit.

"It is probable that, this year, a good many foxes will be killed in order to supply the ranches with the necessary means to provide for the upkeep of the remaining stock, and, as the more farsighted ranchers will undoubtedly kill the animals of the least desirable class, I estimate that a fair average value for the foxes that will be killed will run from \$200 to \$300, but you will understand that this will, of course, depend, to a large extent, upon the trend of fashion next autumn.

"From various conversations with different ranchers I gather that it costs somewhere between \$25 and \$50 to keep a fox for a year, so that, even if the increase only amounted to two pups from each pair, it would seem that, even allowing for a certain number of deaths, due to accidents, etc., there would still be a fair margin of profit left for the well and intelligently managed ranch.

"You will, of course, understand that I look upon this whole business from a fur man's point of view, and not from that of a fox breeder, and from what I have seen of foxes bred in captivity, feel sure that successful ranchers will be able to derive a fair income from this business."

In connection with this work with respect to the protection of game and fur-bearing animals, the committee has again to express its deep appreciation of the services of Dr. C. Gordon Hewitt, whose hearty co-operation throughout the year has assisted greatly in the progress of this branch of the committee's work.

Problems Relating to the Mineral Industry of Canada

BY

W. J. DICK

Mining Engineer, Commission of Conservation

THE war has focussed world-wide attention on the manifold implications of the German system of economic penetration and of commercial and financial control of vitally important industries. The surprising fact is, not so much that Germany has controlled aniline dye, potash salt and other chemical industries, but that her industrial organization and development has enabled her, without imports or exports, to produce all those materials essential for the successful conduct of war. Just as truly, as the war has demonstrated the skill, foresight and preparedness of the Germans in regard to war, shall we be at great disadvantage with respect to German competition in trade unless we learn our lesson from the war.

That the Allies are cognizant of the situation is evident from the economic discussions of the Paris conference, at which Canada was represented by Sir Geo. E. Foster, Minister of Trade and Commerce, who has already done much toward organizing our industries. The conference suggested the following means of encouraging trade:

(a) Abolition of "favoured nation" treatment of the enemy.

(b) Permanent measures of mutual assistance and collaboration among the Allies. It was suggested that, for such permanent measures, the allied nations have recourse to enterprises subsidised, directed or controlled by the governments themselves, to the granting of financial assistance for the encouragement of science and technical research and for the development of national industries and resources, also to customs duties or prohibitions of a temporary or permanent character, or to a combination of any or all of these different methods.

The war has clearly demonstrated that:

(1) Defense is not obtained to-day by fighting men alone but by fighting industries. Behind every man in the firing line in Europe from 3 to 5 persons are employed to supply him with food, ammunition and other needs. To-day from two-thirds to three-quarters of all the industries of the warring nations are engaged in meeting the tremendous requirements of the battle-line.

(2) If a country is industrially unprepared, there is great danger and loss due to unavoidable delay in providing necessities. The necessary steps for industrial preparedness are a cheap form of insurance against such danger, particularly as industrial preparedness is, *per se*, a decided economic gain.

(3) A country must not only have the necessary resources within its borders but must have already established the industries necessary to the manufacture of munitions of war and should, if possible, be independent of essentials from other countries.

(4) The resistance of the enemy has been made possible by the remarkable economic and military organization effected by German engineers and technical men. The lack of such co-ordination on the part of the Allies demonstrates that, in times of peace, engineers must realize their responsibilities and must play an important part in affairs of modern government and of progress.

Having in view the lessons taught by the war and the suggestions outlined above, let us see what can be done in Canada, more especially with reference to the mineral industry.

Technical and Industrial Education

The opinion prevails in Germany that the nation possessing the best educational system is the best prepared to promote industrial progress and national welfare. Neither money nor personal effort appears to be lacking for the establishment and maintenance of institutions, schools, classes and other means which will accomplish these ends. The development of continuation and technical schools, if not the cause of the industrial and economic growth, has accompanied the progress of science and the practical applications of it. In 1910, the Dominion Government appointed a Royal Commission to study the needs and present equipment of the Dominion respecting industrial training and technical education, and the systems and methods of technical instruction obtaining in other countries. The report of the Commission was published in 1913 and is an invaluable examination of Canada's requirements and of the best practical achievements elsewhere.

A proper system of industrial training and technical education aims to promote not only the efficiency of industry but the general welfare of those engaged in it. Under such a system workmen become better educated and more contented. One result of particular importance to the mining industry is that the risk of accident is considerably lessened among trained workers.

The death rate among miners in Canada is greater than in any other civilized country. This is largely due, not to reckless dis-

regard for human life but to the hazardous nature of the work and to the class of labour available for employment. The fatality rate in coal mines in Belgium is the lowest in the world, slightly exceeding one per thousand employed. In 1850, the fatality rate in Belgium was as high as it is in Canada to-day. The decrease is the result of the combined efforts of the mine owners, the workmen, and the administration of mines; it is due, in great measure, to diffusion of technical and professional education. This phase of mining education is of great importance and deserves more attention from our governments, especially as the safety of coal mines depends upon the individual intelligence of every man employed in the mines. The opening of a safety lamp in the mine, the carrying of matches, pipes or tobacco underground is forbidden. It is impossible, however, to keep constantly in touch with every man, and one act of carelessness, negligence or ignorance may blow up the whole mine. Attention should be directed to the education of the workman, that he may not endanger himself and others, and that he may become a more efficient workman and intelligent citizen. The law requires that coal mine officials have a certain standard of competency, yet nothing is done to enable the ordinary miner to qualify for this work.

APPLICATION OF SCIENCE TO INDUSTRY—SCIENTIFIC RESEARCH

Modern industry, to be successful, must be based on scientific research. In Canada insufficient attention has been paid to the advantages of scientific research, and many business men fail to appreciate the economic importance of science. Since the outbreak of war, some of the largest corporations in Canada have taken up this work in their own interests but, naturally, some will not be willing to disclose the results of their investigations. To achieve the greatest success, such as Germany obtained before the war, requires complete co-operation between manufacturers and the Government to eliminate overlapping of effort and to promote the national welfare.

British Advisory
Council

In 1915, Great Britain appointed an Advisory Council, for the threefold purpose of instituting scientific researches, establishing or developing institutions for the scientific study of industrial problems, and for the institution of research studentships and fellowships. It is intended that this Council shall form a permanent organization to promote industrial and scientific research throughout the kingdom and to organize the weapons of industry as the Government has

already organized the weapons of warfare. The Council will undertake a campaign of education to point out to manufacturers the benefits from scientific research. To obtain the closer co-operation of manufacturers, the Council will first attack purely industrial problems, the practical bearing of which can be appreciated by all.

U. S. National Research Council To encourage national efficiency in the United States, the National Academy of Science formulated plans for a National Research Council, whose purpose shall be to bring into co-operation existing governmental, educational, industrial and other research organizations, with the object of encouraging the investigation of natural phenomena, the increased use of scientific research in the development of American industries, the employment of scientific methods in strengthening the national defence, and such other applications of science as will promote the national security and welfare. Especially significant is the proposal to include in the membership of this council "leading American investigators and engineers, representing the army, navy, Smithsonian Institution, and various scientific bureaus of the government, educational institutions and research endowments, and the research divisions of industrial and manufacturing establishments." The members are to be chosen in consultation with the presidents of the leading national scientific, academic and technical societies, while the cabinet officers are to be asked to name representatives of the Government scientific bureaus under their supervision.

In the United States, industrial research is being carried on to a considerable extent in the different Government bureaus and in the universities. The Bureau of Standards was established by the United States Federal Government, primarily for the standardization of weights and measures and the quality of all supplies purchased by the Government. The annual grant was \$100,000. Its research work is of enormous value not only to the Government but to the manufacturer and to the country at large. Although the work done by the Bureau is mainly for the Government, its testing facilities are also employed, to an extent which has reached important proportions of late, for investigations which cannot well be performed in commercial research laboratories. No private enterprise could attempt to maintain a laboratory as well equipped as that of the Bureau of Standards. Since the outbreak of war, the Bureau has assisted manufacturers to produce at home and out of American materials products for which, heretofore, they had been dependent upon foreign supplies.

Canada Appoints an Advisory Council In June, 1916, the Canadian Government appointed, by Order in Council, a Committee of Council, consisting of the Ministers of Trade and Commerce, Interior, Mines, Inland Revenue, Labour and Agriculture. This Committee is charged with, and responsible for, the expenditure of any moneys provided by Parliament for scientific and industrial research. The order also appointed an Honorary Advisory Committee, responsible to the Committee of Council, to be composed of nine members, representative of the scientific and industrial interests of Canada, charged with the following duties:—

(a) To consult with all responsible bodies and persons carrying on scientific and industrial research work in Canada, with a view to bringing about united effort and mutual co-operation in solving the various problems of scientific and industrial research which, from time to time, present themselves;

(b) To co-ordinate, as far as possible, the work so carried on as to avoid overlapping of effort, and to direct the various problems requiring solution into the hands of those whose equipment and ability are best adapted thereto;

(c) To select the most practical and pressing problems indicated by industrial necessities and present them, when approved by the Committee, to the research bodies for earliest possible solution.

(d) To report from time to time the progress and results of their work to the Minister of Trade and Commerce, as chairman of the Committee of Council.

In addition to the necessity for scientific research in connection with the mining industry there is need for the testing and standardization of special mining equipment and chemical and mineral products. For example:—

(a) Standardizing of oxygen and caustic soda or caustic potash for use in mine rescue apparatus.

(b) The testing of miners' safety lamps and lamp parts.

(c) The testing and standardization of explosives for use in different mining operations.

(d) The standardization of chemical fertilizers and other chemical products.

Many imported products are now used in Canada which may, or may not, have been tested or standardized in Germany, United States and elsewhere. If we intend to manufacture these products

in Canada it will be necessary to provide some means for guaranteeing their standard or purity.

Owing to the importance of this subject and to the increasing purchases made by the different departments of the government, it appears advisable that a National Bureau of Standards, similar to that in United States, be established in Canada.

CORRELATING OF DEPARTMENTAL INFORMATION

In this connection it is advisable to emphasize the following recommendation made by a special committee of the Canadian Mining Institute to the Minister of Trade and Commerce:—

Valuable Information Available	“There is at present available in several departments of the Government valuable information relating to resources, industry and trade. This information, however, is not correlated, nor is it in sufficient detail to be utilized effectively. To provide for the proper correlation of this information year by year, it is desirable that a commission be appointed without delay to organize the Departments of the public service to this end. It may here be remarked that similar action has already been taken in the United States. In that country the Bureau of Mines, Geological Survey, Bureau of Animal Industry, Bureau of Plant Industry, Forest Service, Bureau of Chemistry, Bureau of Soils, Bureau of Census, and the Bureau of Foreign and Domestic Commerce co-operate for the correlation of information. The Bureau of Standards has, for its main purpose, the standardization of the mechanical accessories, the processes and the products of these industries; the Bureau of Foreign and Domestic Commerce brings the producer of raw materials into touch with the manufacturer, and the latter into relation with the consumer, through its studies of markets and trade opportunities at home and abroad; and the Bureau of Census is the national bookkeeper of the industries.”
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Co-operation of Producer and User of Mineral Products	In the past much of Canada's ores and unrefined mineral products have been exported for treatment, refining and manufacture. Industries have been established in Canada which require these products but, in many cases, the manufacturer does not know whether the products he requires can be, or are, manufactured in Canada. Moreover, if asked to state what he uses and how much is imported, he hesitates to give the desired information to the producer of mineral products for fear of losing the foreign contracts upon which his business is based.
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The mineral industry may be assisted by having mining trade experts attached to the Department of Trade and Commerce who could act in co-operation with the Manufacturers' Association,

with the Departments of Mines, Provincial and Federal Governments and with British trade and consular officers abroad. The correlated statistics could then be sent to producers and users in the form of weekly or monthly mining trade bulletins, thereby encouraging trade in mineral products both at home and abroad.

ENCOURAGEMENT OF BASIC INDUSTRIES

On account of the small population and domestic markets of Canada, speaking generally, it is unwise to encourage the establishment of highly specialized industries, unless such can compete in outside markets with similar goods manufactured elsewhere. As our home consumption is small in proportion to our resources and to our capacity to produce raw materials, it is desirable that basic industries be established first. Following the growth of home market requirements it will be possible to develop special industries to utilize the basic products. In this connection, national safety as well as economic advantage must be considered, and problems will arise involving not only the establishment but also the location of basic industries. So far as the mineral industry is concerned, the following basic industries are of paramount importance:

- (1) Chemical industries.
- (2) Iron and steel industry.
- (3) Smelting and refining works.
- (4) Coal trade.

A brief discussion of these industries follows:—

Chemical Industries

Chemical products form the basis of many important industries. The following discussion has reference especially to electro-chemical development.

The efficiency and adaptability of electric energy for the refining of metals and the manufacture of chemical products have long been recognized, but it was not until recent years that the industrial world awakened to the importance of the new field. Electric refining, at first applied to copper only, is now being extended to all the metals, and the electric current is also employed in their extraction from the ores. The manufacture of ferro-alloys of chromium, vanadium, molybdenum, tungsten, titanium, silicon, etc., required for special steels, has assumed rapidly increasing importance. The production of aluminum, of calcium carbide, of the abrasives,

of new refractory materials, of graphite, etc., has already created large industries. Sodium compounds and other well-known chemicals have long been manufactured by electrolysis. The fixation of nitrogen, with its many subsidiary industries, such as the manufacture of nitric acid, ammonium nitrate, explosives, etc., the reduction of magnesium and the production of innumerable chemical compounds known at present only to the special trades requiring them, is now under commercial development.

On account of the low efficiency of electro-chemical work and the large amount of power used in the process, one of the controlling factors in the establishment of these industries is cheap electric power. The water-power resources of Canada are not only great, but include many large water-powers situated near tide-water which could be developed and operated at low cost. In addition, their situation and proximity to markets either on the Atlantic or the Pacific offer unrivalled opportunities for the expansion of present and the establishment of new chemical industries. Owing to these advantages, and to the fact that electric current in the eastern United States will become more valuable for power and lighting purposes, Canada is favourably situated to secure the principal electro-chemical and electro-metallurgical industries of eastern North America.

Norway has long foreseen the importance of developing her water-powers and, to-day, her electro-chemical products form the basis of many of the chemical industries in Europe.

The principal electro-chemical industries already established in Canada are: Manufactures of aluminum, acetone, calcium carbide, metallic magnesium, calcium cyanimide, phosphorus, ferro-silicon, and the refining of copper, zinc and cobalt. The first five industries enumerated produce considerable quantities, not only for home consumption but also for export.

In 1913 the United Kingdom imported some \$23,250,000 worth of chemical products, most of which could be manufactured as electro-chemicals. Of this amount over \$2,750,000 worth were electro-chemicals, such as ferro-silicon, spiegeleisen, calcium carbide, and soda compounds. Of these imports of chemical products, Canada only supplied \$200,000 worth and, of the electro-chemicals mentioned, did not export a dollar's worth to Great Britain. On account of the large water-powers situated near our shipping routes we have a splendid opportunity to secure a large share of this trade. Instead of developing our own electro-chemical industries we are developing our water-powers, transmitting the electricity across the

line and building up electro-chemical industries there. As a result of this policy we are: First, developing some of our best water-powers and allowing industries to be created in the United States based upon this power, although experience has shown us that one of the great drawbacks to the economic manufacture of mineral products in Canada is the fact that we have to compete with well established plants to the south of the line. Secondly, if, owing to lack of demand for power in Canada, we allow it to be exported to United States, creating vested interests in that country, it may be difficult to prevent the export of this power when it is required in Canada.

The following extract from the *Seventh Annual Report of the Commission of Conservation** shows the importance of this subject:

"When development commenced at Niagara Falls, there was comparatively little market for electric power on the United States side of the river. Consequently, electro-chemical industries were induced to start, and large blocks of power were contracted for at a comparatively low figure. Considerable quantities of power were also exported from Canada to the United States, some of it being used in the newly started industries. The United States interests now fear that if they do not get the balance of the power that is already available, and can be made available under the existing treaty, at Niagara Falls, that the power will be used in Canada to build up Canadian industries. Before long, the electro-chemical industries, such as those manufacturing nitrogenous products, will be re-establishing themselves elsewhere. Under existing contracts they are getting at \$10, \$12, and \$15 per horse-power power that has a market value in cities in New York state, ranging from \$60 to \$75 and upwards per horse-power. Now, if these industries in the United States can continue to increase their importation of electricity from Canada for a little while longer, and if the available surplus from Canada can once be transformed to the United States, then, according to the New York Public Service Commission, there need be no fear of its being withdrawn. This is a matter of great importance to Canada."

**Nitric Acid
and Fertilizer
Industry**

These industries are closely related. The element, nitrogen, which is the essential constituent of each, may be recovered electrically from the atmosphere.

Nitric acid is the basis of many different chemical industries, including the manufacture of explosives and fertilizers. Commercial fertilizers are necessary for the maintenance of soil fertility. Their extensive use has been a primary cause of the relatively high crop yields in Germany, and an important factor in maintaining the food supply of that country during the war. The

*"Water and Water-power Problems," by A. V. White.

following table shows the comparative crop yields in certain countries, prior to the war:

Country and year	Bushels per acre				
	Wheat	Rye	Barley	Oats	Potatoes
Germany, 1913	35.0	30.4	40.9	61.0	235.4
Russia, 1912	10.1	14.3	16.1	23.6	121.3
Austria, 1912	22.3	23.2	29.7	36.1	148.7
Hungary, 1912	18.8	18.4	25.8	28.9	125.3
France, 1912	20.5	16.4	26.9	35.9	142.7
Canada, 1913	21.04	19.28	29.96	38.78	165.88
U. States, 1914	16.6	16.8	25.8	29.7	109.5
Argentina, 1912-13	13.8			39.2	

During the last thirty years, the crop yields per acre in Germany have nearly doubled. This excellent result is due partly to the development of the farmers' associations, to agricultural schools, and to the employment of modern methods, but chiefly to the ever-increasing use of fertilizers.

On account of Germany's dependence on Chile for her nitrogen supply, in the form of nitrate, the production of substitutes, in the form of ammonium sulphate and ammonia, in which the nitrogen is obtained from the air, has developed at a rapid rate. It is reported that the consumption in 1917 will amount to one and one-half times the consumption in 1913.

NOTES ON FERTILIZERS—Although some fifteen elements are required to sustain plant life, experiment has proven that three, and sometimes four, elements only need be furnished the plant artificially for its complete development. The other elements are present in sufficient quantities in the air and in the soil. Nitrogen, phosphorus and potassium are the elements usually exhausted most readily but, occasionally, calcium is also deficient.

An average soil contains enough plant food for about 100 crops but, unless fresh additions of plant food are made, the production will shrink in a very few years to one-third or one-fourth of the full crop. Once the yield has reached this lower level, it will remain for an indefinite period nearly stationary.

Because of the necessity for adding nitrogen, phosphoric acid and potassium for the growth of most crops, the name 'essential' is

applied to these elements. Nitrogen and phosphoric acid are usually more liable to be deficient than potash, but no one of these essential elements can take the place of another, as each has its particular function to perform. The term fertilizers is applied to materials containing, in available form, any or all of these essential elements. Fertilizers may contain other elements, such as magnesia, sulphuric acid, etc., which, though needed by the crop, are unessential, as the soil contains a sufficient amount.

Nitrogen Fertilizers

Nitrogen is the most important element to consider in the study of fertilizers. It is the most expensive and most fugitive of the 'essential' elements. Nitrogen usually costs about three times as much as phosphoric acid or potash and, to be available as plant food, it must be in the form of nitrates, which are readily soluble in water. Nitrogen exists in different forms, which may, for present purposes, be classified as follows:—

1. Organic nitrogen, found in vegetable and animal substances, generally as protein.
2. Ammonia nitrogen, found in ammonium sulphate.
3. Nitrate nitrogen, found in nitrate of soda (Chile salt-petre) and in nitrate of potash.
4. Calcium nitrate, ammonium sulphate, ammonium nitrate and cyanamide, in which the nitrogen is extracted from the air by electrical means.

1. *Organic Nitrogen Fertilizers*—These fertilizers are manufactured from cotton-seed meal, linseed meal and from fish scrap, dried blood and packing-house waste. Natural guano, or bird excrement, is another important source of such fertilizers.

2. *Ammonium Sulphate* is unlike the organic compounds, as it is not a natural product but a manufacturing by-product, obtained in the coking or distillation of coal which usually contains about 1·8 per cent nitrogen. The ammonium sulphate recovered in plants established in Canada amounts to about 23 lbs. per ton of coal coked. It is guaranteed 24·5 to 25 per cent NH_3 , or equal to about 20·75 per cent nitrogen. In normal years the Canadian production is exported to the United States and the West Indies. Ammonium sulphate is in a form very suitable for distribution in the soil and is readily converted into available plant food. It is more available than the organic forms, is a quick acting fertilizer and suitable, therefore, for quick return in crop production, an especial advantage

for truckers and market gardeners. It is often substituted for nitrate of soda.

3. *Nitrate of Soda*—The nitrogen in nitrate of soda can be used by plants without undergoing any change, and is the highest in point of availability of any of the nitrogenous fertilizers, excepting ammonium nitrate. It diffuses into the subsoil and induces roots to grow deeply. This is advantageous, as it enables plants to withstand dry spells and it increases the area of plant food supply. It is found in extensive deposits near the west coast of Chile and is often called Chile saltpetre. Reports have appeared concerning the rapid exhaustion of these fields but, according to the best authorities, such fears have little foundation. The annual exports are about 2,500,000 tons, while the reserves have been estimated at considerably over 250,000,000 tons. Until the outbreak of the war, the bulk of the Chile nitrate production went to Germany but, at the present time, the greater part of the production is shipped to the United States. In April, 1916, the price of the ordinary 95 per cent nitrate, free alongside vessel at Chile, was \$1.80 per 101.4 lbs. Sodium nitrate contains from 15 to 16 per cent of nitrogen. Besides being a valuable fertilizer it is used to a considerable extent in the manufacture of explosives.

4. *Ammonium Nitrate and Calcium Cyanamide*—The utilization of nitrogen from the air, by artificially uniting and fixing it with other elements to form compounds that could compete with other nitrogenous fertilizer materials, has attracted the attention of chemists and investigators for many years.

In 1903, Berkeland and Eyde were able to prepare nitric acid from the air on a commercial scale, and, in 1907, erected a plant at Notodden, in Norway, utilizing a water-power of 40,000 h.p.; other works, using different kinds of furnaces, quickly followed. These furnaces vary considerably, but the common object is to bring the air into intimate contact with an electric arc. In the Berkeland and Eyde process the gases issuing from the furnace are cooled rapidly and passed into an oxidizing chamber where the nitric oxide is converted into nitrogen peroxide. The gases are then passed to a series of absorption towers, where they pass up through broken quartz and meet a descending shower of water and acid which converts the nitrogen peroxide into nitric acid. The weak acid is concentrated to 40 or 60 per cent strength and is used to decompose limestone, forming nitrate of lime, which, after evaporation, is ready for market. This process has a very low efficiency, namely, 5 per cent, consequently its commercial success depends entirely upon very cheap electric power. In the United States, the manufacture

of nitrates has not been undertaken on account of the low efficiency of this process and because there are innumerable uses for electric power that will bring a greater return. In Canada conditions are not similar and the success of such an undertaking would depend upon tariff conditions and upon markets for the product.

There is an indirect method of preparing nitric acid from atmospheric nitrogen which is more economical of power and has the additional advantage that the plant need not be situated near a huge water-power. This process depends upon the oxidization of ammonia. The ammonia may be prepared in several different ways, directly and indirectly, from atmospheric nitrogen. A simple process is that of passing super-heated steam over cyanamide. The cyanamide is made by passing nitrogen through heated calcium carbide.

The ammonia is mixed with air and passed rapidly over platinum, causing the ammonia and oxygen to unite to form nitric acid and water. The nitric acid is usually neutralized with ammonia, forming ammonium nitrate. Ammonium nitrate is a rich nitrogenous salt, containing 35 per cent nitrogen (over twice the nitrogen content of sodium nitrate). It is ordinarily too expensive to employ for fertilizing purposes but is used extensively in the manufacture of explosives.

Calcium Cyanamide	Calcium cyanamide contains about 20 per cent nitrogen and on most soils has about the same fertilizing value as ammonium sulphate. It is, therefore, highly available and its use is especially advantageous on acid soils. The first step in its manufacture consists in the production of calcium carbide by heating a mixture of coke and limestone in an electric furnace. The carbide is powdered and placed in air-tight, coal-fired retorts. After the carbide has reached a white heat, pure nitrogen gas is passed over it and the carbide absorbs the nitrogen, forming calcium cyanamide. The nitrogen gas is obtained by passing air over red-hot copper or by the liquid-air process. The only plant in North America manufacturing fertilizers in which the nitrogen content is derived from the air is that of the American Cyanamid Co., situated at Niagara Falls, Ont. When established in 1909 this plant had a capacity of 12,000 tons per annum; this was later increased to 64,000 tons. The electric energy continuously used at the plant is approximately 30,000 h.p., the greater portion of which is used in the manufacture of calcium carbide. In the past practically the whole production of this plant has been exported to the United States and her insular possessions, where it was used in the manufacture of so-called complete fertilizers. The following
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are the shipments of cyanamide from Canada to United States, 1909-1913:

1909, 1,450 tons; 1910, 4,650 tons; 1911, 9,500 tons; 1912, 11,100; tons; 1913, 27,400 tons. The average value of Canadian cyanamide exported to the United States, during 1914, was \$51.40 per ton.

Calcium cyanamide may be put to a great number of uses but, thus far, the fertilizer market has absorbed the entire output of the plant. Among the different products which may be manufactured from calcium cyanamide, the following may be noted: Liquid ammonia, ammonium sulphate, ammonium phosphate, ammonium nitrate, ammonium chloride, nitric acid, sodium cyanide and dicyandiamide. All of these products serve a great number of important uses.

IRON AND STEEL INDUSTRY

Although iron ores are widely distributed throughout Canada, the present extensive metallurgical industry in iron and steel has been developed chiefly on the basis of imported ores, notably the conveniently situated and comparatively cheaply mined ores of Bell island, Newfoundland, and ores from the iron ranges in the United States, south and west of lake Superior. Each of these sources contributes about one-half the present imports. There are, nevertheless, important iron ore deposits in Canada which have already contributed considerable outputs in the past, and numerous occurrences of low grade ores which may constitute valuable sources of future supply.

An estimate, covering iron ore deposits upon which more or less work has been done, shows total known available reserves in Canada of about 200,000,000 tons. The great bulk of these ores, however, consists of low grade magnetites and siderites requiring concentration, or desulphurization, before being marketable.

The actual ore production has averaged less than 400,000 tons per annum. Much of this has had to find a market in the United States, not being acceptable to Canadian furnacemen. The blast furnace capacity in Canada is about 1,500,000 tons per annum, whereas actual production has exceeded 1,000,000 tons in one year only. In 1913 Canada consumed over 3,000,000 tons of iron and steel goods of all kinds. Not only are we dependent on foreign imports for 75 per cent of the iron and steel goods consumed in Canada, but even the iron ore which is manufactured into steel in Canada comes from outside sources. To increase the smelting of Canadian ores, it is evident that steps should be taken to encourage domestic smelting.

**Smelting and
Reduction
Works**

Prior to the war, a considerable portion of the world's trade in metals was controlled in Germany. Refining plants were established in that country through government assistance; mine products were imported far in excess of domestic needs and the excess of refined or manufactured articles was exported. To quote one example: The assistance and encouragement given the smelting and refining industry, together with other contributing factors, enabled Germany to purchase the unrefined zinc ores of Australia at a price which not only returned a handsome profit but prevented the establishment of rival smelting plants in the British Empire. When war broke out, Australia had enormous stocks of zinc ores but no zinc smelter. Fortunately, this situation is now changed. The erection of smelting works in Australia has been made possible by the British Government guaranteeing the purchase of the refined product at a certain price for a number of years.

Refining of Metals and Non-metallic Minerals in Canada.—The refining of our raw materials in Canada is a requisite to the manufacture of metallic or non-metallic products. Owing to our comparatively small population, large area, and capacity for production we will be able, for many years, to produce raw materials which, if manufactured, would be largely in excess of our own needs. In the past, we have been content to export most of our raw products for refining, but we have awakened to the necessity for altering that policy. Zinc and copper refineries have recently been established and nickel refineries are being constructed. This change has been brought about by the war. Previously, we refined more or less of our lead, gold, silver and cobalt production; in addition, nickel oxide and a small quantity of metallic nickel were refined. Admitting that Canada can produce and manufacture, or partly manufacture, more than she can consume, the question arises, how are we to dispose of this surplus? In so far as the precious metals and those mineral products of which we have a monopoly are concerned, there is little doubt that we could dispose of them profitably, either as the finished, or partially manufactured, product.

COAL TRADE

The coal deposits of Canada compare favourably with those of the greatest coal mining countries of the world in respect of quality, quantity and accessibility for mining purposes, but, owing to their occurrence in the eastern and western portions of the Dominion, the large central market is supplied by imported coal.

United States bituminous coal is used in the area between a north-and-south line through Farnham, Que., and a line through Battleford

to Moose Jaw and thence to Estevan, Sask. Although a considerable quantity of this coal is used in Manitoba and Saskatchewan, these provinces are also supplied by coal from the Crowsnest, Canmore, Edmonton, Lethbridge and Souris districts.

Eastern Canada possesses no deposits of anthracite coal. As this coal is admirably suited for domestic heating and cooking purposes, it is imported in considerable quantity from the United States and is sold over an area extending from Nova Scotia, in the east, to Battleford, Sask., in the west. The imports in 1913 amounted to over 4,640,000 tons, being more than double the imports of 1906. The demand for this class of coal is increasing, notwithstanding the rising prices.

The supply of anthracite coal in the United States is limited and there is no assurance that its export to Canada will be long continued. In 1913, it was estimated that there were 16,153,000,000 tons of anthracite coal in the United States. In 1913, 91,524,922 tons were mined and, as it has been estimated that for every ton of coal lost a ton and a half is sold or used,* the exhaustion is proceeding at the rate of over 152,000,000 tons per annum. If production continued at the same rate, it would exhaust the anthracite of the United States in little over 100 years. We must, therefore, expect that the price will gradually increase. Coincidentally with the rising price, production will decrease, thus prolonging the life of the mines.

Of the total coal consumption in Canada during 1913, 42·6 per cent was domestic coal and 57·4 per cent imported coal. In 1916 the production amounted to nearly 14,500,000 tons, while the imports for the same year exceeded 17,500,000 tons. In other words, we imported more coal than we produced. The importance of this fact may be more fully recognized when it is realized that, in 1916, the coal production amounted to over 22 per cent of our total mineral production, being valued at about \$38,300,000. The situation then is this: Although Canada has over 17 per cent of the world's reserve of coal, our production is small and we import more than we produce.

It is desirable, both from the mining and national standpoint, that these conditions be changed. This question may be resolved into several special problems:—

- (1) Domestic fuel problem in central Canada.
- (2) Imported bituminous coal fuel on the railways of central Canada and of part of western Canada.
- (3) Domestic fuel problem in Prairie Provinces.
- (4) Cheap power problem in Prairie Provinces.

* *Mineral Resources of the United States—Part II*, 1913, page 728.

It is the purpose of this paper merely to indicate how the foregoing problems may be solved:—

(1) The following solutions of the domestic fuel problem in central Canada are suggested: (a) The installation of by-product coke ovens at certain points on the St. Lawrence and Great Lakes system, the coke being used for domestic purposes in place of anthracite coal. (b) The development of a peat industry. (c) Eventually, no doubt, electric energy will, to a certain extent, replace coal for heating purposes in this area.

(2) In central Canada the electrification of some of our railways may, later, be found to be economically possible. The railway fuel problem in certain portions of Western Canada may be solved by the use of powdered coal (using western lignites or sub-bituminous coal); by the use of a suitable briquetted fuel made from lignites or bituminous coal, and by the further use of our own bituminous coal.

(3) and (4). Two questions of great importance in the Prairie Provinces to-day, the solution of which will become a matter of even greater moment in the future, are the problems of securing cheap power and an assured domestic fuel supply. In western Manitoba, in Saskatchewan, and in eastern Alberta water-power development costs are, in most instances, high. These districts are within reach of great deposits of lignite. It is, therefore, essential that something be done to utilize the low-grade fuels which underlie the greater portion of Alberta and part of Saskatchewan and Manitoba. To make the coal transportable and suitable for domestic and power purposes, it is necessary:

1. That it be of sufficient value to bear the cost of transportation.
2. That it withstand handling and a certain amount of weathering.
3. That it be a suitable fuel for domestic and power purposes.

The above conditions are fulfilled by coal briquettes and carbonized lignite briquettes. The Mines Branch and the Conservation Commission, in co-operation with the Advisory Council on Industrial and Scientific Research, are working on these problems and indications point toward an economic solution.

INDUSTRIAL ALCOHOL

The imports of petroleum and petroleum products into Canada have been rapidly increasing, while the domestic production has been decreasing. The imports of petroleum, crude and refined, during the calendar year 1916 totalled over 292 million gallons, valued at over

\$14,600,000. As our crude petroleum production in 1916 amounted to about $7\frac{1}{2}$ million gallons, valued at about \$392,300, it can be seen that Canada is dependent upon foreign sources for her supplies of petroleum and petroleum products. Ninety-nine per cent of the production of crude petroleum comes from Ontario, but the production is steadily declining in spite of efforts to enlarge the areas of producing fields, or to find new fields.

In considering the development of a substitute for petroleum for illumination, cooking, and for use in internal combustion engines, industrial alcohol, which is used to a considerable extent in Germany and Great Britain, has been suggested.

In 1916, Canadian imports of refined and illuminating oils amounted to over 8,080,107 gallons, valued at \$543,000; during the same year 18,322,000 gallons of gasoline, valued at \$3,625,000, were imported. If industrial alcohol could be produced economically in Canada so as to replace these products there would be a reduction of over \$4,000,000 worth of imports. It has been reported that, on account of the rising price of gasoline, many tractors have been rendered idle in the Prairie Provinces, thus reducing the acreage to be sown. The Director of the United States Bureau of Mines declares that the high prices may not only continue for some time but will undoubtedly reach higher levels before there is any permanent relief. He states that the United States Government will, during the next fiscal year, pay $31\frac{1}{2}$ cents for its gasoline. He, therefore, concludes that if the United States, using such vast quantities, is compelled to pay this high price, the private consumer will have to pay much more. Furthermore, at the present rate of production, the known supply of crude oil in the United States, from which we obtain our present supply of gasoline, will be exhausted in 27 years.

Possibility of
Establishing
Alcohol Industry

In considering the establishment of an alcohol industry in Canada it is necessary to distinguish war conditions from those obtaining in normal times.

As alcohol is essential in the manufacture of smokeless powder, present prices are abnormally high. Normally, there is no great demand for alcohol for this special purpose and it would then have to compete with kerosene and similar products.

The raw materials used elsewhere than in Canada for the manufacture of industrial alcohol are potatoes, sugar beets, molasses and sawdust.

The present price and yield of potatoes in Canada are not such as would warrant the founding of a potato alcohol industry in Canada. W. T. Macoun, Dominion Horticulturist, states that, if

best methods are followed, 300 bushels of potatoes per acre can be produced. He estimates the cost of production and marketing such a crop at $20\frac{1}{2}$ cents per bushel, but says that this will be reduced on large areas where the most modern machinery is used. *The Census and Statistics Monthly* states that the profit per acre, in 1913, for spring wheat grown in Manitoba, Saskatchewan and Alberta was \$2.65, \$1.72 and \$2.09 respectively, so that it is evident that if potatoes were sold at $21\frac{1}{2}$ cents per bushel there would be a greater profit to the farmer than growing wheat in these provinces. Potatoes used in the manufacture of alcohol need not be sacked and may be shipped frozen with but a trifling loss. The establishment of an alcohol industry on a suitable scale would promote profitable agriculture in areas otherwise unsuited to crop growing; the feeding of the spent mash to cattle would encourage live stock growing and the alcohol could be utilized by the farmers as illuminant, for cooking and heating purposes, and as a source of motor fuel.

Another promising field for the development of an alcohol industry in Canada seems to be in the utilization of sawdust and wood waste from our saw-mills. The large mills make practically no use of this material and burners are kept going night and day to destroy the wood waste. The E. J. Du Pont de Nemours Powder Co., the largest powder and explosives manufacturers in the United States, use enormous quantities of spirit in their numerous factories. Their factory at Georgetown, South Carolina, produces nearly 750 gallons of spirit per day from sawdust and wood waste. As the plant is situated near three large saw mills and was established *before* the war, their costs for sawdust alcohol must have been less than for alcohol produced from molasses or any other local product.

Report of Committee on Press and Co-operating Organizations

BY

JOHN DIXON

Editor, Commission of Conservation

DURING a year in which, owing to circumstances, it might have been expected that interest in Conservation on the part of the Canadian press would not receive the usual consideration, it has been an agreeable surprise to find that increased space has been given to the subject. This has included extracts from our published reports and articles reprinted from *Conservation* and *Conservation of Life*. Of special interest this year has been the number of the larger newspapers which have used the information supplied by *Conservation* as the basis for editorials. In this way important results are secured to the Commission's work.

The increasing cost of paper and the necessity of conserving the supply compelled many newspapers and publications to reduce the number of pages. Under these circumstances the pressure upon the news columns, owing to the war, has been severe. The fact that, under this handicap, editors have been able to give space to Conservation subjects is altogether commendable.

Many letters have also been received from editors all over Canada, expressing appreciation of the material supplied by our monthly bulletin, *Conservation*, and each month numerous requests are made for the use of the plates of illustrations appearing therein.

That this publicity is having effect is evidenced by the attention which is being given to conservation. At meetings for the discussion of public affairs, of the extension of trade and of protection of our national interests, conservation of our natural resources almost invariably forms part of the discussion.

Conservation is printed monthly, in English and French, and has a circulation of 12,000 copies. During the year, the chiefs of fire departments, at their request, have been added to the mailing list.

Conservation of Life is issued quarterly, in both English and French. It is the publicity medium of the Town Planning Branch, and is well received by press and public. It has a distribution list of 11,000 copies.



WASTING BY-PRODUCTS FROM COKING OF COAL
Bee-hive coke ovens, Fernie, B. C.



SAVING BY-PRODUCTS FROM COKING OF COAL
By-product coke ovens, Algoma Steel Co., Sault Ste. Marie, Ont.

Special bulletins are issued to newspapers when deemed advisable, and special articles are supplied to newspapers and publications by the staff on request.

Through the courtesy of the Canadian Press Association, our Editor attended the annual meeting in Toronto in June last, when the opportunity of discussing with many of the visiting editors the work of the Commission was taken advantage of. With many interests of a more or less public character appealing for the assistance of the press to attain their objectives, the remarkably cordial manner in which Conservation of Natural Resources is received by the editors personally is appreciated. Newspaper publishers are acknowledged as the leaders of public opinion, and in the work of this Commission they recognize the basis of present and future industry.

The following reports have been issued during the year: *Seventh Annual Report of Commission of Conservation* in English and French; *Dictionary of Altitudes in Canada*, by James White; *Conservation of Fish, Birds and Game*, in English and French; *Report of the Conference of the Civic Improvement League of Canada*, in English and French, and *Water Powers of Manitoba, Saskatchewan and Alberta*, by Leo G. Denis and J. B. Challies, in English and French.

There are in press at the present time the following reports: *Water Powers of British Columbia*, by A. V. White; *Rural Planning and Development in Canada, Part I*, by Thomas Adams; and *Forests of British Columbia*, by Dr. Whitford and Roland D. Craig. The following are in course of preparation: *Forests of Saskatchewan*, by J. C. Blumer; *Housing Survey*, by Thomas Adams; *Fire Waste in Canada*, by J. Grove Smith; and *Fish Waste*, by J. B. Feilding.

The thanks of the Commission are extended to the press of Canada for its generous support, and especially for its assistance in the promotion of the objects of the Town Planning Branch by extended reports of meetings held throughout the country.

Two members of the editorial staff are at present overseas on military duty, Messrs Allan Donnell and P. M. Baldwin. The Commission's contribution to the country's service also includes Dr. C. A. Hodgetts, G. H. Ferguson, E. C. Little and J. Carroll.

Reports of Committees—Resolutions

THE reports of the several standing committees of the Commission, together with their accompanying recommendations, were then presented, as follows:

Committee on Forests

Mr. Clyde Leavitt presented the following summary and recommendations of the Committee on Forests:

1. The various forestry and fire protective organizations of Canada have been severely handicapped in their work through heavy enlistments of technical men and other experienced officials for overseas service, nevertheless, marked progress is to be reported in a number of directions.

2. The Government of New Brunswick is to be congratulated upon the excellent beginning which has been made in the forest survey of Crown lands. In the more technical aspects of this work the Commission of Conservation should co-operate so far as available funds will permit.

In view of the excellent results which, in general, have been secured from the permit system of regulating settlers' clearing fires, it is recommended that this system be extended in the province of New Brunswick, with adequate provision for enforcement.

The hope is expressed that the Provincial Government will, at the proper time, see fit to consolidate, in one centralized organization, with adequate technical staff, all the different lines of forestry and fire protection work now more or less scattered.

3. The fire ranging service of Ontario has now been consolidated with the Forestry Branch, under the Provincial Forester, and a reorganization is under way. This change, which had previously been contemplated, was made imperative by the "Clay Belt" conflagration of last July and August. Assurances have been given by the Minister of Lands, Forests and Mines that, in the work of re-organization, now under way, adequate provision will be made for overhead supervision and inspection, for the construction of improvements such as telephones, trails, lookout towers, etc., and for the regulation of settlers' clearing fires under the permit system. The Government of Ontario is to be congratulated upon this pronouncement. Should it be possible for the Commission of Conservation to co-operate in any way such co-operation should be freely available.

In view of the success of co-operative fire protection in the province of Quebec, between the Government, the limit-holders

and the private owners, the Commission offers the suggestion that the formation of similar associations be considered by the limit-holders and by the Government of Ontario.

The Commission notes with great satisfaction the prospect of the adoption of the permit system for Northern Ontario.

4. Material improvement has been made during the past year in the forest fire laws of Quebec. The St. Maurice and Lower Ottawa Forest Protective Associations have demonstrated in practice the admirable results that follow the adoption of good business methods in this class of work. The organization of additional associations, on a similar basis, is to be encouraged in every way practicable.

The Forest Protection Branch has made an excellent showing, considering the limited funds and relatively small staff available. Representations should, however, be made to the Provincial Government in favour of a materially increased staff of inspectors of fire-ranging on licensed lands, provision for a fire-ranging staff on areas on unlicensed lands having valuable stands of young or mature timber, and a sufficient head-office staff to maintain proper control over the whole.

5. The previous recommendation in favour of a Provincial Forester for Nova Scotia should stand. It is suggested that, eventually, the province should embark upon a policy of re-acquiring cut-over and burned-over non-agricultural timber lands, to supplement the present small area of Crown lands. In this way, and at a relatively small expense, the province can gradually re-establish the basis for a comprehensive policy of forestry practice on Crown lands. The necessary legislation already exists; only the required appropriations are lacking. The possibility of Dominion aid should be considered in this connection.

6. The proposed establishment of a forest school in the University of British Columbia is to be commended. It is to be hoped that favourable action will be taken at an early date.

7. The British Columbia Government should be congratulated on the excellent showing made by the Forest Branch in connection with the various lines of work over which it has jurisdiction. The market extension work is producing results of great importance to Canada as a whole. The prospect of civil service reform is strongly to be commended.

8. Action should be taken looking toward the extension of the permit system of regulating settlers' fires to the unreserved forest areas of the Prairie Provinces.

9. Further representations should be made to the Dominion Government in favour of adequate provision for the enforcement of technical forestry regulations in connection with cutting operations on licensed timber berths, with a view to ensuring the perpetuation of the forest as such.

10. As in previous years, the Commission should emphasize the importance of basing the appointments in forestry and fire protection organizations of the Dominion and Provincial governments on the merit system, through legislative enactment.

11. The pine blister disease seriously threatens our white pine forests, valued at upwards of \$200,000,000. No effort should be spared to locate all existing infections and to secure the eradication of the disease. The province of Ontario has already made an excellent start in this direction, and similar action is proposed by the Government of Quebec. White pine in the Maritime Provinces may later be threatened by the spread of the disease from the state of Maine. The Department of Agriculture, through the Dominion Botanist, has secured, by research, results of great actual and potential value in the control of this menace. All these efforts should be continued and extended. Wherever the work of eradication is not adequately provided for by provincial legislation, the Dominion authority should be invoked, under existing legislation. In order to handle adequately the work which it should undertake in co-operation with the provinces, the Dominion Government should be urged to make an immediate appropriation of not less than \$50,000 for the investigation, location and eradication of the pine blister disease in Canada. In this connection, it is noted that the United States Congress is to be asked to appropriate \$500,000 for similar work to the south of us, in addition to the very substantial amounts made or to be made available by the respective states. The Dominion Government should be urged also to make adequate provision, in whatever manner may be deemed advisable, to prevent the spread of the pine blister disease from infected districts.

We recommend also that, as this matter is of great importance and prompt action is necessary, the Acting Chairman and the Deputy Head of the Commission bring this subject before the Minister of Agriculture and press upon him the importance of immediate action. If deemed advisable a joint deputation might be arranged, in co-operation with the Canadian Forestry Association and the Canadian Society of Forest Engineers.

12. The report upon the investigation of forest resources of British Columbia, by R. D. Craig and Dr. H. N. Whitford, is nearly

completed and will soon be ready for publication. The same is true of the report upon Saskatchewan forest resources by J. C. Blumer.

13. The proposed investigation of the forest resources of Ontario, by the Commission of Conservation, should be approved, with the understanding that attention will first be paid to the question of pulp-wood supplies. The Commission should express to the Government of Ontario its appreciation of the co-operation which has been assured in connection with this important project.

14. The attention of the Research Advisory Council should be drawn to the importance of the basic forest industries in the economic life of the country and to the urgent necessity for research in solving the problems connected with the perpetuation of our forests as such, as well as in connection with the utilization of waste material and with the development of wider markets, both foreign and domestic, for our forest products. The Commission of Conservation should keep in touch with this situation and exert its influence in every practicable way calculated to secure favourable consideration for such work.

15. The Committee on Forests recommends that the Commission approve the proposed special study, during 1917, of the effects of logging and fire on pulp-wood lands in Eastern Canada, with a view to determining what measures are necessary to place the pulp-wood forests of Eastern Canada upon a permanently productive basis. The question of continuing this investigation in future years and of broadening its scope should be taken up with the Research Advisory Council.

16. The establishment of ranger schools should be urged, to facilitate the employment of returned soldiers on forestry and fire protection work, in the Dominion and Provincial services.

DR. FERNOW: I should like to accentuate the point that very active propaganda should be made with respect to the white pine blister disease. That must be acted upon at once, otherwise the disease will spread, and with every year it will become more difficult to cope with. It is therefore urgent that the resolution adopted by the three societies and the Commission should be followed up immediately by the deputation provided for in this report. That I think is the most important point to emphasize.

We have an assurance that the Ontario Government will assist in the collection of data to determine the forest resources of the provinces, and that should be, of course, followed up. There is

nothing new in it—it is simply continuing the work which has been carried on by the Commission for some years.

HON. MR. DANIELS: I should like, for the benefit of my fellow Commissioners, to emphasize the feature of the report with respect to the permit system for the setting of fires. I do this because I know something of its operation in Nova Scotia, and of the great benefit that flows from the introduction of such a measure. It seems to me that the offices of this Commission could be well used in knocking at the door of every Provincial Legislature, and in impressing upon them the necessity of passing measures dealing with fire and forests, including the two principles in respect to which, I am very pleased to say, we in Nova Scotia have been pioneers, that is, the principle of permits for the setting of fires and the principle of forest control. These two changes have worked with us marvellously well and have greatly reduced the fire losses in our province, and I have no doubt would do so in every province in Canada where there is fire loss. I know that this Commission could do no better work than to try and assist the provinces in alleviating the situation in respect to the subject of which I have spoken. I am very glad to note that this permit system was emphasized in this year's report and that this Committee has seen fit to give commendation to those provinces, particularly Ontario, which have seen fit to introduce it. Ontario has introduced it in the northern part of the province, but there is no reason why it should not be introduced, as a matter of legislation, for the entire province, just as for any other province.

On motion of Hon. O. T. Daniels, seconded by Dr. Fernow, the report was adopted.

Committee on Lands

DR. J. W. ROBERTSON: The Committee on Lands begs to report: That, in carrying on the preliminary survey, of which a summary has been presented, its representatives have been accorded cordial co-operation by the county and township authorities and by Provincial and Dominion officials who could render assistance toward the realization of the objects of the survey;

That, the Committee appreciates the value of such co-operation and records its warm thanks to all who have taken part;

That, in pursuance of the plan approved at the last two annual meetings of the Commission, the Committee proposes to devote its attention to the development of illustration work in Dundas county during the next three years and to direct the services of the

Agriculturist to the advancement of such illustration work in the departments and aspects of rural life which have been already outlined, viz:—

1. *Systems and Methods of Farming*—Such as planning, rotation of crops, seed selection, cultivation, live stock, use of manure, etc.
2. *Farm Labour, Machinery and Equipment*.
3. *Business Methods*.—In selling, buying, co-operation, etc.
4. *Public Services*.—Such as railways, roads, telephones, rural free delivery, etc.
5. *Educational Work*.—Through schools, school gardens, home gardens, boys' and girls' clubs, school fairs, etc.
6. *The Promotion of Intellectual, Social, Moral and Ethical Progress*.

That, in view of the very great interest now being taken in the use of commercial fertilizers, and the desirability of placing before the farmers of Canada further reliable information in regard to their uses in the improvement of agriculture, the enlargement of production and the increase of profits, the Committee recommends to the various Departments of Agriculture that renewed efforts be made to direct the attention of farmers to the importance of the subject and recommends the early publication, as a separate, of Dr. Shutt's paper, "Commercial Fertilizers in Canada," delivered at the eighth annual meeting of the Commission of Conservation;

That, on account of the great need of foodstuffs in Canada by Canadians and in Europe by the Allies, the Committee desires to call attention again to the necessity of still greater efforts being put forth towards increased production, and urges that farmers, market gardeners, and all others exert themselves to the utmost and leave nothing within their power undone which will bring about a larger supply of cereal grains, vegetable products, meats, dairy products and other foods.

On motion of Dr. Robertson, seconded by Dr. F. D. Adams, the report was adopted.

Committee on Fisheries, Game and Fur Bearing Animals

DR. C. C. JONES: The Committee on Fisheries, Game and Fur-Bearing Animals has not prepared any written summary of their report. A somewhat lengthy report was adopted by the Committee and appears elsewhere. The chief feature of the work of the year has been the undertaking to investigate the utilization of fish waste. Mr. J. B. Feilding was engaged to carry on that work, and the preliminary report of his work in that connection has been made. We expect, during the first part of the present year at least, to

continue that work and hope to arrive at some very satisfactory results. The Committee offers the following resolutions:

1. Resolution, re amendment of the Northwest Game Act, of 1906, to secure greater protection of the mammals of the Northwest Territories:

That, in view of the conditions brought to the attention of this Commission, at its seventh annual meeting, with regard to the wild life of the Northwest Territories, and in view, further, of the urgency of the situation as disclosed during the past year, representations to the proper authorities be renewed to secure prompt action along the lines indicated in the resolutions passed at the seventh annual meeting and that for this purpose a Committee be appointed to interview the Prime Minister.

2. Whereas, the past year has witnessed the successful conclusion of the Migratory Bird Treaty with the United States, which, in all stages of the negotiations, has been accorded the hearty support of the Commission of Conservation.

This Committee desires to express its gratification at the consummation of this Treaty, and congratulates the Dominion Government upon the successful conclusion of this important convention which will, it is believed, be of inestimable benefit in protecting our menaced game-bird resources.

3. Whereas, the Commission of Conservation realizes the gravity of the situation which has arisen with regard to the halibut fishery of the Pacific coast, and whereas, the United States authorities, in recognition of the danger of depleting this valuable fishery, have initiated protective legislation, which becomes operative only upon the enactment of a similar measure by Canada, be it resolved that the Dominion authorities be urged to utilize the basis for negotiations thus afforded, and to make every effort to secure effective international protection.

4. Resolved that, in view of the necessity for conserving every form of direct and indirect food supply, the research work, conducted by Mr. J. B. Feilding, on behalf of the Commission, in connection with the utilization of fisheries waste, be continued to such extent as circumstances permit.

I would move that the report of the Committee and the above resolutions be adopted. Dr. Howard Murray seconded the motion, which was adopted.

Committee on Minerals

DR. ADAMS: With the outbreak of the war there was a demand on the part, not only of our own manufacturers, but also of the Imperial Government, to speed up the production and the output

of the Dominion in a great many directions. The Canadian Mining Institute, working on behalf of the mineral interests of the Dominion, undertook to make a full report with reference to the question of our mineral resources as they might be available for the Empire at the present time and under the present conditions, and they desired to associate with them the Commission of Conservation in these investigations. Consequently the Chairman of the Commission, Sir Clifford Sifton, placed at the disposal of the Mining Institute, for the collection of information, our mining engineer, Mr. Dick, who during this year has devoted his time practically exclusively to the work I have indicated. He has sent in quite an elaborate report setting forth our mineral resources, more particularly in this aspect, and has also set forth the results which have been obtained in the working up of new materials never before produced in Canada, such as fero-molybdenum and metallic magnesium. Magnesium is now being produced at Shawinigan Falls. When now our troops advance in a night attack on the enemy under the flares of magnesium, the magnesium comes from Shawinigan Falls, in Canada, as the supplies from Germany and Austria were cut off at the opening of the war.

The report of our Committee is too long for presentation here, but it has been adopted and recommended by the Committee. There is, growing out of the report, only one resolution, as follows:

That the Committee desires to call the attention of the Government to the necessity of providing for the testing and standardizing of apparatus used in connection with safety in mines. Many of these safety appliances came from Germany before the war, but they are now made elsewhere, and there is no provision made for testing or standardizing. Consequently safety lamps, etc., are going into mines when there are no proper tests as to their efficiency. They should be subjected to tests and standardization under Government supervision.

I move that this report be adopted and also the resolution. Mr. Snowball seconded the motion, which was carried.

Committee on Waters and Water-powers

MR. MCCOOL: Mr. Chairman and gentlemen, you have all seen the voluminous report from the Water-powers Branch, and I should like to congratulate the officials of that branch on the thoroughness of their work during the past year. Like the other reports it is too voluminous to be read here and it has been passed by the Committee.

On motion of Mr. McCool seconded by Mons. Choquette, the report was adopted. The report by A. V. White will be found on page 227 and that by Leo G. Denis on page 243.

Committee on Public Health

DR. JONES: Mr. Chairman and gentlemen, as you know, the Committee on Public Health has had no formal session, but this morning we met with the medical men who are here and who addressed the Commission so forcefully, and the following resolution was prepared and will now be submitted for the consideration of the Commission:

Resolved, that in view of the prevalence and increasing spread of venereal diseases in the greater cities, and from those centres into the country, and from province to province, and also of the great menace to the health of human kind and future generations of our people, this Commission is strongly of the opinion that the prevention, diagnosis and treatment of venereal diseases is a matter of urgent and grave national concern. This Commission is also of the opinion that the Dominion Parliament and Government should undertake, by means of legislation, or otherwise, such action as will lead to the control and reduction of this scourge. To this end, it is the opinion of the Commission that such legislation or action should provide for:

- (1) Registration of cases without name and address.
- (2) Public registration and isolation of recalcitrants.
- (3) Free treatment for all who apply for it.
- (4) Free bacteriological and blood tests.
- (5) Supervision of mental defectives.
- (6) The administration of the plan by a Dominion body through or in co-operation with, Provincial Boards of Health.

Moved by Dr. Jones, seconded by Dr. Robertson, and carried.

DR. JONES: In connection with the resolution I move, seconded by Mr. J. B. Snowball, that Dean Clarke, of Toronto University, be a Committee to prepare the legislation referred to in this resolution, with power to consult others as he deems fit.*

Moved by Dr. J. W. Robertson, seconded by Dr. C. C. Jones, and

RESOLVED, that the Commission records its warm appreciation of the value of the service rendered by the medical men who presented statements setting forth the grave conditions existing from the

* See Appendix II.

prevalence of venereal diseases and who at the same time made recommendation for effective action to bring about the abatement of the evils and dangers of these conditions, and that the Commission tenders its sincere thanks to these gentlemen.

Planning and Development Branch

HON. O. T. DANIELS: I have been asked to present the following resolution:

Whereas, the conservation of the human resources of Canada is essential to enable more adequate use to be made of the natural resources of the country, and

Whereas, the planning of urban and rural land for purposes of proper development and use, and not for purposes of speculation, is needed as a preliminary means of securing such conservation and of promoting national economy and efficiency, and

Whereas, such planning and development can best be done by local authorities in accordance with principles and procedure laid down in provincial planning and development acts, and with the guidance of an expert planning department in each province, be it

Resolved, that the Commission of Conservation urge the Provincial governments to pass the necessary legislation to secure that all land will be planned and developed for efficiency, convenience, health and amenity and that the necessary administrative machinery be set up for the purpose.

I may say that, as we have this legislation now in the province of Nova Scotia, I can move the adoption of this resolution with very considerable pleasure.

Dr. Robertson seconded the motion, which was agreed to.

DR. ROBERTSON: We learned yesterday that arrangements had been concluded for the retention of the services of Mr. Thomas Adams, who has been acting as Town Planning Adviser to this Commission. As a member of the Commission, and one of the public, I desire to express my gratification at this, and to wish Mr. Adams continued success in the splendid work he has been able to inaugurate and which he has carried forward so far with magnificent success.

Press and Co-operating Organizations

DR. MURRAY: In the absence of Mr. J. F. MacKay, Chairman of the Committee on Press and Co-operating Organizations, it falls to my lot to present the following recommendations of this Committee:

The Committee on Press and Co-operating Organizations begs leave to recommend that the means of publicity at present employed by the Commission be continued, and that as soon as possible, the recommendations made at the last annual meeting regarding the supplying of ready-made lectures and lantern slides for the use of universities and schools be undertaken.

The Committee would also ask that a special vote of thanks be passed to the press of Canada for their very valuable assistance to the cause of conservation by devoting space in their columns during this trying time.

On motion of Dr. Murray, seconded by Dr. Adams, the report was adopted.

Additions to Committees

DR. MURRAY: For one cause or another various Committees of the Commission have been depleted and there is need of some fresh blood in them. I have much pleasure in moving the following appointments to various Committees.

Hon. G. J. Clark, to Committees on Waters and Water-powers and Fisheries, Game and Fur-bearing Animals;

Hon. G. H. Ferguson, to Committees on Waters and Water-powers and Fisheries, Game and Fur-bearing Animals;

Hon. G. W. Brown, to the Committee on Public Health;

Mr. J. P. Babcock, to Committees on Forests, Minerals; Press and Co-operating Organizations, and Fisheries, Game and Fur-bearing Animals;

Hon. E. L. Patenaude, to the Committee on Minerals;

Hon. T. D. Pattullo, to Committees on Waters and Water-powers and Fisheries, Game and Fur-bearing Animals.

On motion of Dr. Murray, seconded by Mgr. Choquette, the motion was adopted.

Adjournment

Senator EDWARDS: I think that this closes the business of this session, and on behalf of the Chairman, Sir Clifford Sifton, I thank you all for your presence and for the attention that you have given to the various subjects that have come before you. I think that this meeting has been a very fruitful and successful one.

Appendix I

Migratory Bird Treaty

CONVENTION BETWEEN THE UNITED KINGDOM AND THE UNITED STATES OF AMERICA FOR THE PROTECTION OF MIGRATORY BIRDS IN CANADA AND THE UNITED STATES.

Whereas, many species of birds in the course of their annual migrations traverse certain parts of the Dominion of Canada and the United States; and

Whereas, many of these species are of great value as a source of food or in destroying insects which are injurious to forests and forage plants on the public domain, as well as to agricultural crops, in both Canada and the United States, but are, nevertheless, in danger of extermination through lack of adequate protection during the nesting season or while on their way to and from their breeding grounds;

His Majesty the King of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas, Emperor of India, and the United States of America, being desirous of saving from indiscriminate slaughter and of insuring the preservation of such migratory birds as are either useful to man or are harmless, have resolved to adopt some uniform system of protection which shall effectively accomplish such objects; and to the end of concluding a Convention for this purpose have appointed as their respective Plenipotentiaries:

His Britannic Majesty, the Right Honourable Sir Cecil Arthur Spring-Rice, G.C.V.O., K.C.M.G., &c., His Majesty's Ambassador Extraordinary and Plenipotentiary at Washington; and

The President of the United States of America, Robert Lansing, Secretary of State of the United States;

Who, after having communicated to each other their respective full powers, which were found to be in due and proper form, have agreed to and adopted the following articles:—

ARTICLE I

The High Contracting Powers declare that the migratory birds included in terms of this Convention shall be as follows:—

1.—Migratory Game Birds:

(a) Anatidæ or waterfowl, including brant, wild ducks, geese and swans;

(b) Gruidæ or cranes, including little brown, sandhill and whooping cranes;

(c) Rallidæ or rails, including coots, gallinules and sora and other rails;

(d) Limicolæ or shorebirds, including avocets, curlew, dowitchers, godwits, knots, oyster catchers, phalaropes, plover, sandpipers, snipe, stilts, surf birds, turnstones, willet, woodcock and yellowlegs;

(e) Columbidaæ or pigeons, including doves and wild pigeons;

2.—Migratory Insectivorous Birds:—

Bobolinks, catbirds, chickadees, cuckoos, flickers, fly-catchers, grosbeaks, humming birds, kinglets, martins, meadow-larks, nighthawks or bull bats, nuthatches, orioles, robins, shrikes, swallows, swifts, tangers, titmice, thrushes, vireos, warblers, wax-wings, whippoorwills, woodpeckers and wrens, and all other perching birds which feed entirely or chiefly on insects.

3.—Other Migratory Nongame Birds:—

Auks, auklets, bitterns, fulmars, gannets, grebes, guillemots, gulls, herons, jaegers, loons, murre, petrels, puffins, shearwaters, and terns.

ARTICLE II

The High Contracting Powers agree that, as an effective means of preserving migratory birds there shall be established the following close seasons during which no hunting shall be done except for scientific or propagating purposes under permits issued by proper authorities:—

1. The close season on migratory game birds shall be between March 10 and September 1, except that the close season on the limicolæ or shorebirds in the Maritime Provinces of Canada and in those states of the United States bordering on the Atlantic ocean which are situated wholly or in part north of Chesapeake bay, shall be between February 1 and August 15, and that Indians may take at any time scoters for food but not for sale. The season for hunting shall be further restricted to such period not exceeding three and one-half months as the High Contracting Powers may severally deem appropriate and define by law or regulation.

2. The close season on migratory insectivorous birds shall continue throughout the year.

3. The close season on other migratory nongame birds shall continue throughout the year, except that Eskimos and Indians may take at any season auks, auklets, guillemots, murre and puffins, and their eggs for food and their skins for clothing, but the birds and eggs so taken shall not be sold or offered for sale.

ARTICLE III

The High Contracting Powers agree that during the period of ten years next following the going into effect of this Convention, there shall be a continuous close season on the following migratory game birds, to wit:

Band-tailed pigeons, little brown, sandhill and whooping cranes, swans, curlew and all shorebirds (except the black-breasted and golden plover, Wilson or Jack snipe, woodcock, and the greater and lesser yellow legs); provided that during such ten years the close seasons on cranes, swans and curlew in the province of British Columbia shall be made by the proper authorities of that province within the general dates and limitations elsewhere prescribed in this Convention for the respective groups to which these birds belong.

ARTICLE IV

The High Contracting Powers agree that special protection shall be given the wood duck and the eider duck either (1) by a close season extending over a period of at least five years, or (2) by the establishment of refuges, or (3) by such other regulations as may be deemed appropriate.

ARTICLE V

The taking of nests or eggs of migratory game or insectivorous or nongame birds shall be prohibited, except for scientific or propagating purposes under such laws or regulations as the High Contracting Powers may severally deem appropriate.

ARTICLE VI

The High Contracting Powers agree that the shipment or export of migratory birds or their eggs from any state or province, during the continuance of the close season in such state or province shall be prohibited except for scientific or propagating purposes, and the international traffic in any birds or eggs at such time captured, killed, taken or shipped at any time contrary to the law of the state or province in which the same were captured, killed, taken, or shipped shall be likewise prohibited. Every package containing migratory birds or any parts thereof or any eggs of migratory birds transported, or offered for transportation from the Dominion of Canada into the United States or from the United States into the Dominion of Canada shall have the name and address of the shipper and an accurate statement of the contents clearly marked on the outside of such package.

ARTICLE VII

Permits to kill any of the above named birds which, under extraordinary conditions, may become seriously injurious to the agricultural or other interests in any particular community, may be issued by the proper authorities of the High Contracting Powers under suitable regulations prescribed therefor by them respectively, but such permits shall lapse, or may be cancelled, at any time when, in the opinion of the said authorities, the particular exigency has passed, and no birds killed under this article shall be shipped, sold, or offered for sale.

ARTICLE VIII

The High Contracting Powers agree themselves to take, or propose to their respective appropriate law-making bodies, the necessary measures for insuring the execution of the present Convention.

ARTICLE IX

The present Convention shall be ratified by His Britannic Majesty and by the President of the United States of America by and with the advice and consent of the Senate thereof. The ratifications shall be exchanged at Washington as soon as possible, and the Convention shall take effect on the date of the exchange of the ratifications. It shall remain in force for fifteen years, and in the event of neither of the High Contracting Powers having given notification, twelve months before the expiration of said period of

fifteen years, of its intention of terminating its operation, the Convention shall continue to remain in force for one year, and so on from year to year.

In faith whereof the respective Plenipotentiaries have signed the present Convention in duplicate and have hereunto affixed their seals.

Done at Washington, this 16th day of August, 1916.

(L.S.) CECIL SPRING-RICE

(L.S.) ROBERT LANSING

To give effect to the foregoing Convention, Hon. Dr. Roche, Minister of the Interior, on June 21, 1917, introduced in the House of Commons, Canada, the following Bill, known as Bill No. 92:

BILL 92

AN ACT RESPECTING A CERTAIN CONVENTION BETWEEN HIS MAJESTY AND THE UNITED STATES OF AMERICA FOR THE PROTECTION OF MIGRATORY BIRDS IN CANADA AND THE UNITED STATES.

Whereas on the sixteenth day of August, one thousand nine hundred and sixteen, a Convention was signed at Washington respecting the protection of certain migratory birds in Canada and the United States, and ratifications were exchanged at Washington on the seventh day of December, one thousand nine hundred and sixteen; and, whereas, it is expedient that the said Convention should receive the sanction of the Parliament of Canada and that legislation be passed for insuring the execution of the said Convention: Therefore His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

1. This Act may be cited as *The Migratory Birds Convention Act*.

2. The said Convention of the sixteenth day of August, one thousand nine hundred and sixteen, which is set forth in the Schedule to this Act,* is hereby sanctioned, ratified and confirmed.

3. In this Act and in any regulation made thereunder, unless the context otherwise requires:—

(a) "close season" means the period which during any species of migratory game, migratory insectivorous, or migratory nongame bird is protected by this Act or any regulation made under this Act;

(b) "migratory game birds" means:—

Anatidæ or waterfowl, including brant, wild ducks, geese and swans;

Gruidæ or cranes, including little brown, sandhill and whooping cranes;

Rallidæ or rails, including coots, gallinules and sora and other rails;

* Migratory Bird Treaty, p. 289.

Limicolæ or shorebirds, including avocets, curlew, dowitchers, godwits, knots, oyster catchers, phalaropes, plovers, sandpipers, snipe, stilts, surf birds, turnstones, willet, woodcock, and yellowlegs;

Columbidæ or pigeons, including doves and wild pigeons;

(c) "migratory insectivorous birds" means:—

Bobolinks, catbirds, chickadees, cuckoos, flickers, flycatchers, grosbeaks, humming birds, kinglets, martins, meadowlarks, nighthawks or bull bats, nuthatches, orioles, robins, shrikes, swallows, swifts, tanagers, titmice, thrushes, vireos, warblers, waxwings, whippoorwills, woodpeckers and wrens, and all other perching birds which feed entirely or chiefly on insects;

(d) "migratory nongame birds" means:—

Auks, auklets, bitterns, fulmars, gannets, grebes, guillemots, gulls, herons, jaegers, loons, murres, petrels, puffins, shearwaters, and terns;

(e) "Minister" means the Minister of the Interior;

(f) "regulation" means any regulation made under the provisions of section four of this Act.

4. (1) The Governor in Council may make such regulations as are deemed expedient to protect the migratory game, migratory insectivorous and migratory nongame birds which inhabit Canada during the whole or any part of the year.

(2) Subject to the provisions of the said Convention, such regulations may provide,—

(a) the periods in each year or the number of years during which any such migratory game, migratory insectivorous or migratory nongame birds shall not be killed, captured, injured, taken, molested or sold, or their nests or eggs injured, destroyed, taken or molested;

(b) for the granting of permits to kill or take migratory game, migratory insectivorous and migratory nongame birds, or their nests or eggs;

(c) for the prohibition of the shipment or export of migratory game, migratory insectivorous or migratory nongame birds or their eggs from any province during the close season in such province, and the conditions upon which international traffic in such birds shall be carried on;

(d) for the prohibition of the killing, capturing, taking, injuring or molesting of migratory game, migratory insectivorous or migratory nongame birds, or the taking, injuring, destruction or molestation of their nests or eggs, within any prescribed area;

(e) for any other purpose which may be deemed expedient for carrying out the intentions of this Act and the said Convention, whether such other regulations are of the kind enumerated in this section or not.

(3) A regulation shall take effect from the date of the publication thereof in the *Canada Gazette*, or from the date specified

9. Any person who assaults, obstructs or interferes with any game officer or peace officer in the discharge of any duty under the provisions of this Act, or of any regulation, shall be guilty of a violation of this Act.

10. Any person who wilfully refuses to furnish information or wilfully furnishes false information to a game officer or peace officer respecting a violation of this Act or of any regulation, the existence of or the place of concealment of any bird, nest or egg, or any portion thereof captured, killed or taken in violation of this Act or of any regulation, shall be guilty of a violation of this Act.

11. Any game officer or peace officer may enter any place or premises in which he has reason to believe there exists migratory game, or migratory insectivorous, or migratory nongame birds, nests or eggs, or any parts thereof, in respect of which a breach of this Act or of the regulations may have been committed, and may open and examine any trunk, box, bag, parcel or receptacle which he has reason to suspect and does suspect contains any such bird, nest or egg, or any part thereof.

12. Every person who violates any provision of this Act or any regulation shall, for each offence, be liable upon summary conviction to a fine of not more than one hundred dollars and not less than ten dollars, or to imprisonment for a term not exceeding six months, or to both fine and imprisonment.

The following Bill, House of Representatives Bill, No. 2612 and Senate Bill, No. 1,553, was also introduced into the United States House of Representatives on April 10, 1917:

BILL

TO GIVE EFFECT TO THE CONVENTION BETWEEN THE UNITED STATES AND GREAT BRITAIN FOR THE PROTECTION OF MIGRATORY BIRDS CONCLUDED AT WASHINGTON, AUGUST SIXTEENTH, NINETEEN HUNDRED AND SIXTEEN, AND FOR OTHER PURPOSES.

Be it enacted that the Senate and House of Representatives of the United States of America in Congress assembled, That this Act shall be known by the short title of the "Migratory Bird Treaty Act."

Sec. 2.—That unless and except as permitted by regulations made as hereinafter provided, it shall be unlawful to hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time or in any manner, any migratory bird, included in the terms of the convention between the United States and Great Britain for the protection of migratory birds concluded August sixteenth, nineteen hundred and sixteen, or any part, nest, or egg of any such bird.

Sec. 3.—That, subject to the provisions and in order to carry out the purposes of the Convention, the Secretary of Agriculture is authorized and directed, from time to time, having due regard to the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, to determine when, to what extent, if at all, and by what means, it is compatible with the terms of the Convention to allow hunting, taking, capture; killing, possession, sale, purchase, shipment, transportation, carriage, or export of any such bird, or any part, nest, or egg thereof, and to adopt suitable regulations permitting and governing the same, in accordance with such determinations, which regulations shall become effective when approved by the President.

Sec. 4.—That it shall be unlawful to ship, transport or carry, by any means whatever, from one state, territory, or district to or through another state, territory, or district, or to or through a foreign country, any bird, or any part, nest, or egg thereof, captured, killed, taken, shipped, transported, or carried at any time contrary to the laws of the state, territory or district in which it was captured, killed, or taken, or from which it was shipped, transported, or carried. It shall be unlawful to import any bird, or any part, nest, or egg thereof, captured, killed, taken, shipped, transported, or carried contrary to the laws of any province of the, Dominion of Canada in which the same was captured, killed, or taken, or from which it was shipped, transported, or carried.

Sec. 5.—That employees of the Department of Agriculture authorized by the Secretary of Agriculture to enforce the provisions of this Act shall, with respect thereto, have the same powers as are conferred by law on marshals with respect to executing the laws of the United States. Any such employees shall have authority, without warrant, to search any place other than a dwelling, and, with warrant, to search any dwelling, if he shall have reason to suspect that there is concealed therein any bird, or any part, nest, or egg thereof, which has been captured, killed, taken, shipped, transported, or carried, or which is possessed, contrary to the provisions of this Act or of any regulation made pursuant thereto. The several judges of the courts established under the laws of the United States and United States Commissioners may, within their respective jurisdictions, upon proper oath or affirmation showing probable cause, issue warrants in all such cases. All birds, or parts, nests, or eggs thereof, captured, killed, taken, shipped, transported, carried, or possessed contrary to the provisions of this Act or of any regulations made pursuant thereto shall, when found, be seized by any such employee, or by any marshal or deputy marshal, and, upon conviction of the offender or upon judgment of a court of the United States that the same were captured, killed, taken, shipped, transported, carried, or possessed contrary to the provisions of this Act or of any regulation made pursuant thereto, shall be forfeited to the United States and disposed of as directed by the court having jurisdiction.

Sec. 6.—That any person, association, partnership, or corporation who shall violate any of the provisions of said Convention or

of this Act, or who shall violate or fail to comply with any regulation made pursuant to this Act, shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined not more than \$500, or be imprisoned not more than six months, or both.

Sec. 7.—That nothing in this Act shall be construed to prevent the several states and territories from making or enforcing laws or regulations not inconsistent with the provisions of said Convention or of this Act, or from making or enforcing laws or regulations which shall give further protection to migratory birds, their nests, and eggs, if such laws or regulations do not extend the open seasons for such birds beyond the dates approved by the President in accordance with section three of this Act.

Sec. 8.—That until the adoption and approval, pursuant to section three of this Act, of regulations dealing with migratory birds and their nests and eggs, such migratory birds and their nests and eggs as are intended and used exclusively for scientific or propagating purposes may be taken, captured, killed, possessed, sold, purchased, shipped, and transported for such scientific or propagating purposes if and to the extent not in conflict with the laws of the state, territory, or district in which they are taken, captured, killed, possessed, sold, or purchased, or in or from which they are shipped or transported if the packages containing the dead bodies or the nests or eggs of such birds when shipped and transported shall be marked on the outside thereof so as accurately and clearly to show the name and address of the shipper and the contents of the package.

Sec. 9.—That the unexpended balances of any sums appropriated by the Agricultural Appropriation Acts for the fiscal years nineteen hundred and seventeen and nineteen hundred and eighteen, for enforcing the provisions of the Act approved March fourth, nineteen hundred and thirteen, relating to the protection of migratory game and insectivorous birds, are hereby reappropriated and made available until expended for the expenses of carrying into effect the provisions of this Act and regulations made pursuant thereto, including the payment of such rent, and the employment of such persons and means, as the Secretary of Agriculture may deem necessary, in the city of Washington and elsewhere, co-operation with local authorities in the protection of migratory birds, and necessary investigations connected therewith.

Sec. 10.—That if any clause, sentence, paragraph, or part of this Act shall, for any reason, be adjudged by any court of competent jurisdiction to be invalid, such judgment shall not affect, impair, or invalidate the remainder thereof, but shall be confined in its operation to the clause, sentence, paragraph, or part thereof directly involved in the controversy in which such judgment shall have been rendered.

Sec. 11.—That all Acts or parts of Acts inconsistent with the provisions of this Act are hereby repealed.

Sec. 12.—That this Act shall become effective immediately upon its passage and approval.

Appendix II

Draft Bill

AN ACT RESPECTING TRADE IN CERTAIN MEDICINES AND APPLIANCES

HIS MAJESTY, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

Interpretation

1. In this Act the following words and expressions have the following meanings:

“Venereal disease” means and includes syphilis, gonorrhœa, and soft chancre.

“Provincial license” means a license granted under Provincial authority to manufacture, compound, sell, deal in or dispose of medicines, instruments or appliances for the alleviation or cure of venereal diseases.

“Medical practitioner” means a person duly licensed or entitled under the laws of the Province or of Canada to practise medicine or surgery in the Province.

2. When the Governor in Council is satisfied that under the laws and regulations of, or under arrangements made by any Province of Canada, proper laboratory and other facilities have been provided in such places in the Province as the Governor in Council deems sufficient for the diagnosis and treatment, free or substantially without profit, of venereal disease, and that such diagnosis and treatment are being carried on—under satisfactory control and direction,—and that satisfactory arrangements have been made by the Province for the granting of licenses, free of charge, or on payment of fees approved of by the Governor in Council, to persons to manufacture, compound, sell, deal in, or dispose of medicines, instruments or appliances for the alleviation or cure of venereal disease,—the Governor in Council may, by proclamation, published in the Canada Official Gazette and in the Official Gazette of the Province, declare that this Act shall come into force in such Province on and after a date to be named in such proclamation, and thereupon this Act shall come into force in such Province in accordance with such proclamation, but unless and until so proclaimed this Act shall not come into force.

3. When this Act is in force in any Province, no person (other than a medical practitioner) who does not hold a provincial license therefor, at the time, shall, within the Province, manufacture, compound, sell, deal in or dispose of any medicine, instrument or appliance for the alleviation or cure of venereal disease; and no person, unless he holds such license or be a medical practitioner, shall by

publication or otherwise advertise any such medicine, instrument or appliance, or inform any person, other than a medical practitioner, by advertisement, publication or otherwise, where, within or without the Province, any such medicine, instrument, or appliance may be obtained, otherwise than from a person holding such a license, or from a medical practitioner, *provided* always that an advertisement or publication by a newspaper or other publication made in good faith for a person holding a Provincial license or being a medical practitioner, shall be deemed the act of such person and not of the newspaper or other publication.

4. Any person contravening any of the provisions of Section 3 hereof shall be guilty of an offence against this Act, and shall on summary conviction be liable to a fine not exceeding..... or to imprisonment not exceeding....., or to both in the discretion of the court or magistrate trying the case.

5. A prosecution for an offence against this Act shall be brought within months after the alleged offense was committed and not afterwards.

Dr. Clarke writes under date of May 3rd, 1917, that a Bill covering the original recommendations was not draughted because "the province of Ontario has undertaken free treatment and free bacteriological and blood tests. Our idea was that the Dominion Government would co-operate with the different provinces. The only point on which there has been any difference of opinion is that in regard to the registration of cases without name and address. There appear to be practical difficulties in the way at the moment, but no doubt these will be accomplished in due course.

"It is felt by our committee that Ontario having gone as far as it has in this matter, the other provinces will follow suit, and Mr. Lash, after spending many weeks thought that if we could get the Dominion Government to carry into effect the plan outlined, plus a promise to aid the Provincial Governments with a certain proportion of the cost for treatment and diagnosis, we would be going as far as is necessary at the present moment."

Dr. W. S. McCullough, Chief Officer of Health for Ontario, writes, under date of May 15th, 1917, regarding the action being taken by that province, "The present plan of the Provincial Board of Health is as follows: We are establishing three centres for diagnosis, namely, in connection with the Provincial Board's laboratories at Kingston, London and Toronto. Each of these places will be provided with adequate facilities for the free diagnosis of syphilis and gonorrhoea. We expect the project to be in operation early in June.

"In connection with treatment, the Board is of the opinion that this should be carried out, not by the Board, but by medical men and institutions such as first-class hospitals, because the function of the Board is prevention rather than treatment.

"The difficulty in treatment has been the excessive cost of Salvarsan and its substitutes, one of which is manufactured in this city. Consequently, the Board, which has facilities for the manufacture of a substitute for Salvarsan, has applied to the Commissioner of Patents for a license to carry on the preparation of this product in order that its price may be cheapened to the public. This action is in line with the efforts of the Board in its free distribution of diphtheria antitoxin and other biological products. We have no new legislation on the subject. We should, however, have legislation prohibiting quack practices, and the advertising of quack medicines for the cure of these diseases.

"In addition to the efforts already outlined, we are carrying on an extensive propaganda of education by means of exhibits and distribution of literature."

Correspondence with the other provinces has elicited the information that nothing definite has been done in the direction of putting into effect the establishment of laboratories for free diagnoses of syphilis and gonorrhoea.

Appendix III

Breeding of Mink in Captivity

BY

E. L. MACDONALD, Halifax, N.S.

(Note:—Recent developments in the fur-farming industry have naturally created much less interest than in the earlier years, especially in financial circles. Nevertheless experimental work of great importance to the future character and progress of the industry is constantly being conducted. Fur-farming has heretofore been connected chiefly with fox ranching, which is only one, though the most extensive, branch of the industry. The following evidence respecting the breeding of mink in captivity will be of interest to those who have essayed the difficult task of domesticating this delicate and valuable fur-bearer.—ED.)

During the past five years, I have been much interested in reading the opinions, experiences, etc., appearing from time to time in the different periodicals and the Government reports relative to mink farming.

In the spring of 1914, I decided to try if some success could not be attained with this highly nervous and delicate animal, and bought two pairs from a rancher. As one of these had been injured when caught, it died shortly afterwards, but after some difficulty I was able to purchase another one, which was a female. In the spring of 1915, I had fourteen live minks, but, unfortunately, on account of not separating the young of one of the families from the mother soon enough, I lost the mother. In the spring of 1916, I had forty-six to take care of, and, profiting by my experience of the previous year, was able to save all of them. This year, with no bad luck, I will probably have one hundred animals.

The work is very interesting and it is most amusing at times to see the young play like so many kittens. If their surroundings are at all natural, with the proper care in feeding and a little judgment in the mating season, I can see no reason why anyone so inclined, cannot raise mink both profitably and as a pastime.

I find the ranch bred mink are more contented and much larger than the wild ones, and believe the regular feeding is conducive to better fur. Being larger, of course, the animal is more valuable from every standpoint.

The pens should be large enough for them to play in, and as natural as is possible, although they are animals that do not require any luxuries if their house is dry and clean.

If any of your readers care to see my ranch, I will be glad, if the time is opportune, to show same to them.

Appendix IV

Distillation of Coal

BY

E. T. P. SHEWEN, M. CAN. SOC. C.E.

Consulting Engineer, Dept. of Public Works, Canada

IT may be said that in exporting raw material, a country derives from its natural products the least advantage; and that in manufacturing before exportation, the fuller the steps taken, the greater the resulting profit. For instance, exporting wood pulp, either chemical or mechanical, is a step beyond the shipment of the small round spruce timber from which it is made, yet the next and more profitable stride would be the manufacture of paper and exportation of the finished product. Again, spruce deals, which may be considered to represent the staple export of New Brunswick, are little more than timber cut into portable form for conveyance to the factory. When sent across the Atlantic they are regarded as raw material on the other side and are sawn into scantling, boards, box shooks, etc., processes which might perhaps profitably be carried on in the land of production before exportation.

Among natural substances, coal appears to present an unusually wide field for manufacture before exportation, by what is curiously called destructive distillation, or the method of extracting the manifold by-products contained in that mineral.

From coal, as carbonized at the gas works, four principal products are obtained, *viz.*, illuminating gas, coke, coal tar, ammoniacal water.

Of course, coal from different fields and even from different seams may vary in composition, but on coking in proper ovens one ton of average coal may be said to yield:

(a) Ten thousand cubic feet of illuminating gas, the commercial value of which is known to many householders.

(b) One-half ton of coke, equal in value to the cost of the ton of coal originally started with.

(c) Twelve gallons of coal tar, the quantities varying according to the temperature of distillation and the quality of coal.

(d) Some ammoniacal liquor.

The tar is the mother of the infinite by-products derived from coal, of which aniline dyes, many drugs, carbolic acid, naphtha, anthracene and creosote may serve for examples. After these and other substances have been extracted, a valuable residue yet remains in the form of pitch.

In the course of simple distillation, coal tar gives off, in the successive stages of the process, according to Mills, on an average the following products:—

First running.....	2.5
Light oils.....	5.0 = 7.5
Creosote, oils, naphthalene and phenol.....	27.5
Anthracene oil.....	10.0
Pitch.....	55.0
	<hr/>
	100.0

Chemische Industrie gives the following percentage of average distillation:—

Benzol, toluol.....	0.80
Higher benzol.....	0.60
Crystallized carbolic acid.....	0.20
Cresol.....	0.30
Naphthalene.....	3.70
	<hr/>
	5.60
Creosote oil.....	24.00
Anthracene (pure).....	0.20
Pitch.....	55.00
<hr/>	<hr/>
	15.20
	<hr/>
	100.00

On further intricate treatment, involving high technical skill, numerous products useful in chemistry and in commerce are obtained from the light oils.

In view of the prospective development of the Grand Lake coal areas, a slight review of the advantages derived from distillation, in contrast to those accruing from exportation of coal, may be of interest. Considering, therefore, only the more direct and more easily obtained results, the practical products of a ton of coal, reached by ordinary distillation, would stand thus:—

1. Ten thousand cubic feet illuminating gas, 17 candle power.
2. One-half ton of coke, equal in value to the original ton of coal.
3. Some ammoniacal liquor, which, if not at first, could later be utilized.
4. Twelve gallons of coal tar, breaking up on distillation into: (a) One and one-half gallons light oils; (b) three gallons of creosote; (c) six to seven gallons of pitch, the residue left in the still when all is over.

1. For good gas, at cheap rates, there would certainly be domestic demands, not only at all times for illuminating purposes, but in the summer months for cooking also. But even in the absence of public demand, the gas with a naphtha spray would form the fuel for the retorts. One part of coke converted into producer gas is sufficient to carbonize ten parts of coal.

2. Whenever steam is used there is a ready market for coke, the value being usually double that of coal at the pit mouth.

3. Leaving out the question of ammoniacal liquor, we come to the consideration of:

4. Coal tar. (a) In this paper, treatment of the light oils* will not be considered; (b) creosote. For good creosote, at cheap rates, there should be local demands for use in preserving timber. So much damage is inflicted by the teredo and limnoria on breakwaters, piers, and wharfs constructed of timber, that erection of works for impregnating wood with creosote is only a question of time, and it is to be hoped the period will be short.

The quality of creosote, however, is of the utmost importance, and this seems to depend in part on the coal and in part upon the temperature maintained during distillation. The best creosote is known as London oil, and is distilled from tar obtained by coking Newcastle coal at high temperature. For marine works, the specific gravity as well as the constituents of the creosote are of high importance because the preservative action is both chemical and mechanical. Generally speaking, the specific gravity should be 1.055, the percentage of tar acids should be small, and as few as possible of the constituents should be either volatile below 600 Fahr., or soluble in water. Wood creosote is of no use as a protection against marine worms. In addition to maritime works, creosote could profitably be applied as a preservative to railway sleepers.

(c) Pitch, the residue left in the still when all is done, is now principally used in making so-called asphalt pavements and in making patent fuel—that is, bricks moulded of one part pitch and four parts coal dust. A few years ago an Oriental market was opened for patent fuel which raised the price of pitch to 27s. per ton at Cardiff. Even at this high price, the demand continued greater than the supply. All the pitch used in the asphalt pavements in St. John, N.B., is imported.

For small operations, an ordinary three-quarter boiler plate still, holding 1,000 to 1,200 gallons, is found convenient, since the charge represents a day's work. Stills of higher capacity, reaching even to 4,000 gallons, are sometimes preferred.

* From the lighter oils of coal-tar are extracted, besides aniline dyes, many chemicals of commercial importance. Among them are carbolic acid, used in the manufacture of picric acid, a constituent of our explosive lyddite, and toluol, which in some way enters into the unknown composition of trinitrotoluene, used in the German shells. The reported scarcity of aniline dyes, drugs, and some materials for explosives, can be met in great degree by the destructive distillation of coal, which is now transported from the mine in Canada almost universally as raw material.

Supposing a still holding 1,000 gallons of London tar to be used (5.3 tons, specific gravity 1.145 to 1.16), a day's work would represent, according to A. J. Dickinson:

	Gallons	By volume per cent.
Naphtha (containing 6 per cent of benzol).....	30	3
Ammoniacal water.....	30	3
Anthracene (at 25 per cent).....	10	1
Creosote, lubricating oils, carbolic acid, etc.....	280	28
Pitch.....	650	65
	<hr/> 1,000	<hr/> 100

But the 1,000 gallons of tar broken up by this distillation were obtained from 83 tons of coal, which at the same time produced 830,000 cubic feet of illuminating gas and 42 tons of coke. The gas and coke must be, therefore, added to the list given above.

Supposing, without reference to current prices and for the sake of comparison only, a ton of Grand Lake coal, say at the pit mouth, to be worth \$2.50 or \$4.50 in the market, the 83 tons, if sold as mined without distillation, would bring \$373.50, while if distilled, considering only the principal by-products, the same quantity of coal would bring in:

42 tons of coke at \$5.....	\$210.00‡
830,000 cubic feet illuminating gas at, say 50c. per M...	415.00
Creosote 25 per cent, 250 gallons at 8c.....	20.00
Say, 3 tons of pitch, worth at Cardiff 27s., or \$6.75 per ton	20.25

Total result from distillation of 83 tons of coal which, if sold without distillation would have brought only \$373.50.....	\$665.25
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In practice, it would probably be found at first that the principal profit lay in the coke and pitch. Afterwards, as the enterprise developed, commercial use of the illuminating gas would follow, besides treatment of the lighter oils, and the gradual working up of all waste products into the innumerable chemicals derived from coal.

One measure of a country's prosperity is the extent of the consumption of coal and iron; while a good measure of its civilization is the extent to which waste products are utilized.

Familiarity with each step of every process is indispensable for success in destructive distillation, and any attempt to succeed without the aid of the services of a highly trained chemist, thoroughly skilled in extracting and treating the by-products of coal, would result in commercial failure.

‡ Value of the coal at the pit mouth \$207.50.

Besides the general advantages derived by the community at large from the establishment of a new industry, the householder should be especially interested in the production of cheap gas; the Public Works Department in the extraction of creosote; the Intercolonial railway in the manufacture of coke, and the corporation in the home production of pitch for the asphalt pavements, which are so extensively and so efficiently made in St. John.

The subject of distillation of Grand Lake coal is well worth the attention of enterprising capitalists.

Appendix V

Long Sault Development Company—Opinion of the Supreme Court of the United States

Long Sault Development Company, Plain- tiff in Error,	}	Error to the Supreme Court of the State of New York.
<i>vs.</i> Homer D. Call (as successor of John J. Kennedy), as Treasurer of the State of New York, Defendant in Error.		

(December 11, 1916).

Mr. Justice Clarke delivered the opinion of the Court.

This proceeding was commenced in the Supreme Court of New York by the Long Sault Development Company, hereinafter called the plaintiff, for the purpose of testing the constitutionality of an Act of the Legislature of that state, passed in 1907, to incorporate the plaintiff and to grant to it important rights in the bed of, and with respect to the use of the waters of, the St. Lawrence river. (Laws of 1907, ch. 355).

The case is now in this court on the claim that this Act of 1907 is a valid law and that the property rights, springing from the grants therein and the acceptance of them by the plaintiff, were impaired by a later Act, passed in 1913, purporting to repeal the Act of 1907, and by the effect given to this later Act by the decision of the Court of Appeals, rendered in June, 1914.

The title of the Act of 1907 indicates the comprehensive character of the grants which the Legislature attempted to make by it. It reads as follows: "An Act to incorporate the Long Sault Development Company, and to authorize said company to construct and maintain dams, canals, power-houses and locks at or near Long Sault island for the purpose of improving the navigation of the St. Lawrence river and developing power from the waters thereof, and to construct and maintain a bridge, and carry on the manufacture of commodities."

The Act proceeds, first, to incorporate the Long Sault Development Company, giving it perpetual corporate existence, and then in terms to authorize it to construct, maintain and operate dams, canals, reservoirs, and the appurtenances necessary or useful for the purpose of developing water-power and electrical energy, at such point or points adjacent to the south shore of the St. Lawrence river, and in and upon the river bed near Long Sault island or Barnhart's island, as may be selected by the company; to erect and maintain power-houses and electrical transmission appliances; and to construct a bridge or bridges across the river, in connection with the dam authorized, and to charge tolls for passage thereon.

These important rights are declared to be granted upon various specified conditions, the most important of which is "that the rights hereby granted shall be so used as never to impair or obstruct the navigation of the Saint Lawrence river, but, on the contrary, that such navigation shall be preserved *in as good condition as, if not better than the same is at present*, regard being always had to the amount of the natural flow of water in said river as affecting its navigability from time to time."

The Act further provides that, after the Congress of the United States shall authorize the construction of the proposed dams, locks and canals, and after the payment of certain sums of money into the State Treasury, then the commissioners of the land office shall, upon application of said corporation, "*grant unto it the title and interest of the people of the state in and to lands under the waters of the Saint Lawrence river to be covered or occupied by said works and locks and powerhouses.*" The payments to be made, after the year 1911, shall not be less than \$25,000 for each year. The petition alleges that the river at Long Sault rapids is now practically unnavigable, being navigated only by light draft passenger vessels down stream during the summer tourist season and that all other traffic up and down the river passes around the rapids by way of the Cornwall canal on the Canadian side of the river.

The plaintiff was duly organized as a corporation and expended a large sum of money in preparing to utilize the grants of the Act.

By an Act which became a law on the 8th day of May, 1913, the legislature of the state in terms repealed this Act of 1907, under which the plaintiff in error is claiming.

Almost three months before this repealing Act was passed this suit was commenced by the filing of a petition in the Supreme Court of New York, praying for a writ of mandamus, to be directed to the Treasurer of that State, requiring him to receive as a payment into the Treasury of the State the sum of \$25,000, as the sum due and payable on February 1st, 1913, for the year 1912, under the provisions of the Act of 1907, which sum had theretofore been tendered to the Treasurer and had been by him refused, for the reason, it is alleged, that he had been advised by the Attorney General of the State that said Act was unconstitutional and void. The application of the petitioner for a writ of mandamus was denied by the Supreme Court and this decision was affirmed by the Appellate Division and by the Court of Appeals which ordered the record in the case remitted to the Supreme Court, to be proceeded upon according to law.

Up to this time there is nothing in the record before us to indicate that any question was presented to the state courts, excepting the single one as to whether or not the Act of 1907 was valid under the constitution of the state of New York.

More than a month later, on the 14th day of July, 1914, the Court of Appeals, on motion of the plaintiff, requested the Supreme Court to return the remittitur to the Court of Appeals, which court then amended the same by incorporating therein the statement that "Upon the argument of the appeal in this cause before the

Court of Appeals" there was submitted a brief, containing five specified points. Of these in "Point III" alone counsel for the plaintiff for the first time, and then only by way of argument, attempted to present a federal question by claiming that if the repealing Act is to be regarded as an attempted condemnation of the special franchises claimed by the plaintiff it "would be unconstitutional in that such franchises were not taken by the state for public use," in violation of the Fourteenth Amendment to the Constitution of the United States.

It is significant to note that the Court of Appeals, in its decision, rendered before the remittitur was thus amended, did not treat or regard the repealing Act as "an attempted condemnation of the special franchises claimed by the plaintiff," nor did it afterwards so treat it.

Upon the record just described the plaintiff in error comes into this court, claiming that the act of the Legislature of the State of New York of 1907 is a valid, constitutional law, and that, it having been accepted and acted upon by the plaintiff, contract and other property rights resulted which, under the decision of the Court of Appeals, have been impaired or taken away by the repealing Act of 1913, in violation of the Constitution of the United States and of the Fourteenth Amendment thereto, and it therefore prays for a reversal of the judgment of the Supreme Court, entered pursuant to the decision of the Court of Appeals.

The defendant in error meets this claim of the plaintiff by a denial of the jurisdiction of this court, for the claimed reason that the Court of Appeals reached the conclusion that the Act of 1907 was unconstitutional and void without reference to, and without giving any effect to, the subsequent repealing statute.

The grants of the Act of 1907 are such that, if it was a valid law, upon their being accepted, they constituted property or contract rights, of which the plaintiff could not be deprived, and which could not be impaired, by subsequent legislation, and, therefore, the denial by the defendant in error of the jurisdiction of this court renders it necessary for us to determine whether the Court of Appeals, in its decision, gave any effect to the repealing Act. If it did not give effect to that Act, either expressly or by implication, this court is without jurisdiction to review its decision, for the reason that the provisions of the Constitution of the United States for the protection of contract rights are directed only against the impairment of them by constitutions or laws adopted or passed subsequent to the date of the contract from which such rights spring, and do not reach decisions of courts construing constitutions or laws which were in effect when the contract was entered into, as has been held by a long line of decisions extending from *Knox v. Exchange Bank*, 12 Wall. 379, to *Cross Lake Shooting and Fishing Club v. State of Louisiana*, 224 U.S. 632.

In deciding this question, this court is not limited to the mere consideration of the language of the opinion of the state court, but will consider the substance and effect of the decision, and will for itself determine what effect, if any, was given by it to the repealing Act. *Fisher v. City of New Orleans*, 218 U.S. 438; *Cross*

Lake Shooting and Fishing Club v. State of Louisiana, 224 U.S. 632, and *Louisiana Railway and Navigation Co. v. New Orleans*, 235 U.S. 164. While this court will exercise independent judgment as to the scope of the decision of the state court, it will give to that decision that respectful and sympathetic attention which is always due to the highest court of a state (*Fisher v. City of New Orleans*, *supra*), with the presumption always in mind, that the state courts will do what the constitution and laws of the United States require. *Neal v. Delaware*, 103 U.S. 370, 389; *Chicago, etc., R.R. Co. v. Wiggins Ferry Co.*, 108 U.S. 18; *New Orleans v. Benjamin*, 153 U.S. 411, and *Defiance Water Co. v. Defiance*, 191 U.S. 184.

An examination of the opinion of the Court of Appeals shows that the court in its consideration of the repealing Act of 1913, not only did not give to it an effect which would impair any contract relation springing from the Act of 1907, but that, on the contrary, it concluded that the repeal "could not operate to confiscate any valid franchise or property right which the Long Sault Development Company had previously acquired under the Act repealed," and that this conclusion made it necessary for the court to "consider and determine whether the legislature possessed the constitutional power to convey away the state control over the navigation of the St. Lawrence river to the extent attempted by the Act of 1907."

And then, addressing itself to the constitutional problem thus stated, the court proceeds, upon principle and authority, to decide: That, under the constitution of the state of New York, the power of the legislature of that state to grant lands under navigable waters to private persons or corporations is limited to purposes which may be useful, convenient or necessary to the public; that it has no power to so part with the title to such lands that the state may not in the future improve navigation over them, if the public interest shall so require; and that they are held by the state on such a trust for the public use that the legislature has no power to authorize the conveyance of them to a private corporation to maintain navigation thereover "in as good condition as . . . at present," thereby parting for all time with its power to improve such navigation.

The court finds its principal authority for these legal positions in the decision of this court in *Illinois Central Railroad Company v. Illinois*, 146 U.S. 387, in which it was decided: That the title which a state holds to land under navigable waters is different in character from that which it holds in land intended for sale and occupation, in the former case it being held in trust for the people of the state, in order that they may enjoy the navigation of the waters and carry on commerce over them, free from obstruction or interference by private parties; that this trust devolving upon the state in the public interest is one which cannot be relinquished by a transfer of the property; that a state can no more abdicate its trust over such property, in which the whole people are interested, so as to leave it under the control of private parties, than it can abdicate its police powers in the administration of government

and the preservation of the peace; and that the trust under which such lands are held is governmental so that they cannot be alienated, except to be used for the improvement of the public use in them.

This was a pioneer decision upon the subject at the time it was rendered by a divided court, but the principles upon which it proceeds have been frequently approved by this court. *Morris v. United States*, 174 U.S. 196; *United States v. Mission Rock Co.*, 189 U.S. 391, 406; *Kean v. Calumet Canal Co.*, 190 U.S. 452, 481; and they have been very widely approved by many of the highest courts of the states of the Union. *Rose's Notes on U.S. Reports*, Vol. 12, p. 270; Supp. III, p. 291; Supp. V, p. 369.

Having arrived at these conclusions of law, the Court of Appeals proceeds to make application of them to the Act of 1907, and concludes that that Act, in terms, virtually turns over to the corporation the entire control of the navigation of the Long Sault Rapids (provided that the consent of Congress to the grant could be obtained), requiring only that the company shall pay certain stipulated sums of money, and that it shall preserve the navigation of the river "in as good condition as . . . the same is at present," and says that, no matter how much the interest of the public might demand the improvement of the river in the future, the state would be powerless to act, either directly or by constraint upon the corporation, and for this reason it concludes that the Act is, in substance, an abdication of the trust upon which the state holds control over the St. Lawrence river as navigable water and that, therefore, it is unconstitutional and void. Whether this construction placed upon the Act is the one which the court would place upon it if coming to an original interpretation of it, we need not inquire, for, under the authorities hereinbefore cited, the prohibition of the constitution against the impairing of contracts by state legislation does not reach errors committed by state courts when passing upon the validity and effect of a contract under a constitution or laws existing when it is made.

This discussion of the decision by the Court of Appeals makes it very clear that that decision does not give any effect whatever to the repealing Act of 1913, but that, wholly independent of that Act and proceeding upon sound principle and abundant authority, the court arrived at the conclusion that the Act of 1907 was unconstitutional and void, and therefore it results that this case does not present any question for decision under the Federal Constitution, and that, for want of jurisdiction, the writ of error must be *Dismissed*.

Mr. Justice McKenna and Mr. Justice Pitney dissent upon the ground that Chapter 355 of the Laws of 1907 of the State of New York, creating the Long Sault Development Company and conferring upon it certain rights and franchises, when accepted, as it was, by the company, constituted a contract between the state and the company; that the repealing Act and accompanying legislation passed in 1913 (Chaps. 452 and 453) had the effect of impairing the obligation of that contract, in contravention of Section 10 of Article I of the Federal Constitution; and that effect was given to the latter legislation by the decision under review.

Appendix VI

Ottawa Civic Improvement League

A MEETING of the Ottawa Civic Improvement League was held in the lecture room of the Ottawa Normal school on Wednesday evening, January 17. Hon. Sydney Fisher, Chairman of the League, in opening the meeting, said: We have called this meeting on behalf of the Civic Improvement League of Ottawa, as a preliminary to the meeting of the council of the National Civic Improvement League, which is to take place in Ottawa, to-morrow.

I have been asked to make a short statement of what the Ottawa Civic Improvement League has been able to do during its short existence. There had to be some preliminary consideration, some preparations, but we have got under way three or four projects which tend in the direction of civic improvement and in which our League can certainly be of use to the civic authorities and to the community, and in that way I trust we will be able to justify our existence and to lead to future developments that will be of still greater value. When we commenced we thought it not wise to attempt too many projects at first. Many things were brought up which would be of value and service to the community, and which might be taken up and made the subject of agitation by the League, but the executive, in council, thought that, on the whole, it would be better to deal with a few things, to try and make an impression with those things, and to succeed, at least to a certain extent, with them; in that way gaining experience with ourselves and making a showing which would inspire confidence and interest in the work of the League.

The first question taken up was the establishment of an industrial farm in connection with the city jail, to take the prisoners out of the jail and place them in the open air at useful work; this will give them better conditions of life and a better hope and opportunity in the future of becoming useful citizens, instead of being enemies to the social order. In Toronto an industrial farm of this character was established. We drew the attention of the Board of Control of the city to it, and the committee which appeared before them had a pretty lengthy discussion. We found that the Board of Control had had a report made some time before by two officers of the city and that the report had been read, and given some little thought, by the members of the Board; but the matter had lagged, and there was nothing really projected at that time. As a result, therefore, of our visit the members of the Board of Control paid a visit to Toronto and examined the industrial farm there, obtaining much information in regard to it. That we might not be behind the Board of Control, the secretary of the Civic

Improvement League and myself also visited Toronto and investigated the industrial farm. After the visits to Toronto we again interviewed the Board of Control, and found very favourable consideration of the project on the part of the Board. It was suggested that a joint committee of the Board and this League might consider the question in greater detail and perhaps might go so far as to examine sites for an industrial farm of that character. The committee was appointed shortly before the civic elections, and, with the civic elections, and other interruptions due to the holiday season, nothing further has been done. But another committee has been appointed and that committee and we are going to meet immediately to discuss the situation and see what can be done in a practical way.

Another question came up in regard to electric signs in the streets of Ottawa. There was a proposition, very strongly supported and urged by a number of people, that the by-law regulating the distance which electric signs are allowed to project over the streets from the buildings in this city should be increased, and that these signs might be permitted to project eight feet instead of the present limit of five feet. We made protest against the passing of that by-law by the Board of Control and the aldermen of the city, and I am glad to say that our protest, also fortified probably by other protests, was effective, and the law remains as it was before—a little bit of good work, I think, on the part of the Civic Improvement League.

The question of garbage collection was taken up and discussed. A committee was appointed to get information and to make suggestions. That committee reported to the council of the League and on that report representations were made; and, perhaps, I am not boasting on behalf of the League when I say that the present discussion by the Board of Control and the city engineer, and the advance which seems to have been made towards collection of garbage by the city, which reports to the League show would likely be done more economically and more efficiently by the city than by contractors, are no doubt largely due to the efforts of the League.

We also considered the questions of municipal abattoirs and traffic regulations. The committees charged with these matters have made reports which have been adopted by the council. They have shown an evident careful consideration of the subject, and, while they are not yet prepared to present an entire solution of the difficulties in connection with these two subjects, they have received and are still under consideration, and shortly, I trust, we will be able to present to the civic authorities some information and some recommendations covering these two subjects.

Another subject considered in the League was the question of social centres. It has been felt by a number of charitable people in this city that there were many people with rather poor and miserable home surroundings who had no place to go where they could get cheer, with lights and heat, perhaps secure some refreshments, and at the same time have social enjoyment and intercourse. We were appealed to by Miss Whiteaves, who had done a good deal

of work of this kind. Miss Whiteaves had been active in the Rochesterville neighbourhood, where the population is largely of foreign origin, mostly from the eastern part of Europe; the elders of the families could hardly speak English, and the children were growing up with no place to play except in the public streets, which made them a nuisance to the neighbourhood, and the practice was harmful to themselves. A committee appointed to deal with the subject has made very considerable progress, almost verging on accomplishment, towards providing Miss Whiteaves with an organization and with larger premises than she has had in the past, in that particular neighbourhood, and with better support and better facilities, and opportunities of providing a social centre. There the children and youth of that neighbourhood may have a gathering place under good circumstances and surroundings and influences, and may also have some teaching and training which they otherwise would not get. The premises we have secured have the conveniences, and we would like to create there a social club, to be managed by a committee of the people themselves, with their own ideas and their own ways, so as to attract their own people into this social life. I feel myself, personally, and I know others who think that, now that the bars are abolished and banished from Ontario—and most fortunately banished—that there was almost a duty laid upon the people here to provide something to take the place of the bars. There is no doubt that these people obtained a certain amount of social enjoyment—and conviviality, if you like—at any rate, the brightness and heat and light, that they could get at these centres, of which we have deprived them. It seems to us that there is a liability laid upon us to provide a substitute for the bar-room and the saloon. I need not say that what we will provide will be infinitely better for the people in every respect; but at the same time there is no doubt that in the human being there is a want, a desire, for something of that kind, and that they will have it if they can possibly get it. They will have it, with bad and malign influences, unless they can get it with good influences and under moral conditions. It seems a duty for the community to provide something of this nature.

In conjunction with Miss Whiteaves' work, we hope to provide in Rochesterville a social centre of that kind. The organization is not yet perfected, arrangements are not yet completed, but I trust and believe, from the progress made towards it, that in the next few weeks a social centre of that kind will be in existence. We thought it was better to take up a particular project and try and make a success of it before attempting to extend that movement over the whole city. Having Miss Whiteaves' experience and connection with such work in the immediate neighbourhood, we accepted her appeal and undertook to try and help her and to bring about this improvement in Rochesterville. If that is made a success and shown to be useful there, it can be repeated in other parts of the city.

We have also discussed the question of the children's detention home. In connection with the children's courts there is a children's detention home near Dow lake, where children who come before

the courts and who are condemned can be sent, instead of being sent to the ordinary jail. It is very advantageously situated, but is unfortunately in a very bad building, a building which has been condemned by the sanitary and fire authorities as being unsafe and improper for such a purpose. Mr. W. L. Scott, president of the Children's Aid Society, under whose care this charitable institution is being operated by the city, is anxious to secure a better building for the purpose. A representation has been forwarded to the City Council embodying a report against the building and asking the civic authorities to provide a suitable one. This matter having been brought up to the attention of the Mayor, the Board of Control and City Council, action should be taken during the coming year, so that what one might be almost tempted to call a disgrace to the city of Ottawa should be wiped out, and a proper detention home for these unfortunate children be provided.

These are the things with which we have been occupying ourselves. In each individual detail they perhaps do not affect any immense area of the city or any very large proportion of our fellow citizens; but in the aggregate, if we can succeed in helping on these things, we will do good to the city and justify the existence of a League for improvement in the city of Ottawa.

I should like to add this: I do not think it is the purpose or business of the League itself to do this charitable work, this work that needs to be organized. We believe that what the League ought to do, and can do to the best advantage, is to aid existing organizations, to try and give them publicity, try and help them, one in relation to another, to co-ordinate their work, to see that their work does not overlap, and that energy is not wasted; and, above all, to sustain them in their appeals to the public or in their appeals to the civic organization of the city of Ottawa, and possibly to help to create any new organizations which may be needed for work which is not now attended to. That, I think, is the best work the League can do and the work we have most in mind to do.

I am glad of this opportunity of saying these few words in explanation of the work which has been accomplished by the League, and of the aims and objects of the League. Your chief interest and intention in coming here to-night, I am quite sure, is to listen to Mr. Thomas Adams, the expert on town planning of the Conservation Commission. I am going to take this opportunity of announcing to the ladies and gentlemen present what was announced yesterday at the meeting of the Conservation Commission, that Mr. Adams' services to Canada in regard to town planning, which have already been very great and which have made a notable change in the Dominion of Canada, have been secured for the further period of three years. Mr. Adams is going to stay with us and help us in this very important work in the Dominion of Canada for that further period.

ADDRESS OF MR. THOMAS ADAMS

MR. THOMAS ADAMS: Mr. Chairman, ladies and gentlemen: I think we are to be congratulated on this meeting, because it will enable that very admirable address of Mr. Fisher's, setting out

concrete facts that illustrate the work in which you are engaged in in Ottawa, to be distributed through the whole of the Dominion, accompanying the report which will be issued of the proceedings of the Conservation Commission. I think it desirable that the work of the Ottawa League should be widely known, not only because it is important, but also because, in many of the spheres of activity which you are taking up, you are working along somewhat different lines to the other Leagues.

The question of civic improvement is one which is going to be of the greatest importance after the war. We all know that at the present time it is difficult to get people to think about home problems at all. Their newspaper, morning and afternoon, is full of the details of the great war in which we are all interested. Their family life is perhaps linked up with problems and with sorrows and with personal relationships in connection with the war which make it very difficult for people to think about anything at all except the matters that are concerned with that great conflict. At the same time we have to find some room in our minds for the consideration of these social and economic problems that are certain to arise, and in proportion as we are able to think out these problems beforehand—and fit ourselves for dealing with them, we will be able to carry out in practice after the war is over the right principles of conservation and development in this great country.

The words "conservation and development" practically suggest to us the line along which our whole activity, political and social, federal, provincial and municipal, will have to be directed after the war. Being interested in civic improvement we are more concerned with the municipal side. Sometimes we are apt to under-estimate the tremendous power of the municipal organizations as a means of administering our social affairs. We mistrust our local authorities too much; we will have to trust them more if we want to make them more worthy of being trusted. I can see opportunities for increasing central activity, for securing through the Federal Government collections of vital and municipal statistics, for starting research work into great national problems, for setting up, if you will, a central organization for dealing with public health matters. I can see great scope for Provincial Governments to pass legislation which will facilitate the dealing with a great many social questions of a municipal nature and suggesting the lines of procedure along which these questions can be solved, and providing the machinery by which it will be difficult for members of local councils to do what is wrong. But, at the same time, I can see still greater opportunity in giving added responsibility to those who are administering the local affairs of the country in connection with a great many matters which we are attempting to solve now by central machinery, and which we cannot solve properly because of the tremendous size of the country and the scattered nature of our population. Some of you may know that in Switzerland even the military organization is municipal. Every little municipality, every village commune in Switzerland, is part of the military machinery of Switzerland, and when the central body wishes to organize the military forces, to collect horses and bring together the human

units of the military organization, they set to work every village organization, and the whole thing works as a perfect machine because of the local knowledge that these village organizations have. We have the same thing in part in Great Britain to-day. A great deal of the military work, and of the after-war problems, is being delegated to the municipality. Outside of the municipality as an organ of government, it is very desirable to stimulate public opinion to take an interest in municipal questions. We sometimes grumble at the kind of men who serve on local authorities, and yet they simply reflect the kind of people who place them in that position. If they are bad, it is because we do not concern ourselves sufficiently with the problems with which they deal. If they do what is wrong, it is because we permit them and ignore our duties in electing them. They are apt to assume that in Britain the local affairs are managed by men who are born rulers of local affairs, whereas you will find in the local municipality in Great Britain just as much tendency to corruption, just as much frailty of human nature, as in your local municipalities in this country. But there is an organization at work there which, while leaving the local municipality to do its work properly, prevents the possibility of graft or a tendency to do wrong on the part of the members of local authorities; so that even when in Great Britain they have a council of men not imbued with the right spirit to manage local affairs, they have such an arrangement in connection with their municipal government as prevents them from carrying out any wrong ideas in connection with that management. That is what we want in Canada more than simply going about grumbling at the kind of men we have in control of these affairs. At the same time we want, as a further corrective to any wrong-doing on the part of those we elect to public office, an informed public opinion. We want men who will not merely devote themselves to destructive criticism, who will not indulge in that most useless of things, grumbling about past mistakes which they cannot rectify, but will devote themselves to considering these problems from a constructive point of view, and will place before county and city and village councils and electorates, as you are placing before Ottawa, constructive suggestions of improvements which can be carried out and problems which can be solved with a reasonable amount of attention and money. I think that such bodies as we have in Canada, such as are headed here by Hon. Mr. Fisher, and which are at work in other cities, through which we are going to build up gradually a Dominion Civic Improvement League, with local branches which will provide us with that representation of public opinion outside of actual municipal bodies will be of tremendous service in connection with future work. One of the directions in which that might be well done would be to secure the delegating of greater responsibility from the central governments to the municipal in connection with the administration of many affairs. I shall mention one, namely, the question of dealing with returned soldiers. How can we deal with returned soldiers effectively by thinking in Dominion-wide terms, even by thinking in terms of a province? We must have machinery, from the Federal Government, through the

provinces, down to the municipalities, who have local knowledge of the men who come back, who have knowledge of the opportunities for work and also have the responsibility of providing some part at least of the support which these men will require. We want that great machine between the Federal, Provincial and Municipal Governments at work, but we do not want to have the municipality neglected in connection with problems with which the municipal authorities are familiar in their particular district. I mention that because I think we ought to consider, in connection with the building up of the Civic Improvement Leagues, the importance of the municipality.

Then I come more intimately to the question of what these Civic Improvement Leagues could do in connection with social life and land development. After all, the most important problem we have to solve in Canada is the conservation of human life. There are two means by which we may increase production: One by adding to the population, and a second by stimulating the activity, and adding to the intelligence of the citizens that we already have. We need to obtain more accurate vital statistics so as to be able, on a problem of saving human life, particularly in reference to prevention of diseases, to have accurate information. The largest number of deaths from tuberculosis are among men of workable age, from 20 to 60 years, and a great deal of that is preventable. It would be preventable if we had better sanitation, better ventilation and urged people to live in more healthy conditions.

Then we have other problems as well, such as that due to economic loss from sickness. We are not using our resources to the best advantage, nor are we stimulating our people to do so. Hon. Senator Edwards, in opening the meeting of the Commission of Conservation yesterday, said that a great many of our resources were not so extensive as we thought, that they were limited in a more remarkable degree than a great many people thought; but, after all, while they may be limited in amount at the present moment, in proportion as you are able to increase population and to apply intelligence and science to the development of these resources, they are practically unlimited. We have plenty of railways for all our wants for a good many years, subject to the addition of such extensions as may be necessary to add contributory railways to main traffic lines. What we want most of all is human activity applied to the resources which we have, and the means of distribution which we possess. We want to increase human activity both on the part of the people we have and of those we bring into the country.

That suggests the greatest problem which we, as Leagues, have to deal with, the question of the conservation and development of human life from a purely commercial and material standpoint. There is no raw material of industry more important to preserve and develop than human life, and manufacturers are beginning to recognize that. That being so, when we come to consider what are the things that injure human life, we find such questions as housing and land questions,—and of course land questions are at the root of housing questions. No question is so important in connection with the health of the people as that of the housing of

the people. And we have slums in Canada; we have conditions which are unsatisfactory from a sanitary point of view, and conditions which can be rectified by suitable legislation. I suggest that that is one of the first problems with which we ought to be concerned as Civic Improvement Leagues.

I do not know whether many of you have studied the question of how we plan our land in Canada. We do plan it—or at least we survey it—but the thing is that we do not survey it with a definite purpose in connection with our industries and our agriculture, and for the promotion of healthy living conditions. We lay down a geometrical system, largely because of its simplicity and, unfortunately, to some extent because it enables us to speculate and to assist speculation as the result of growth of population. We must plan and develop our land in the right way. Some of the Civic Improvement Leagues are dealing with that problem in different parts of the province, and I want now to show in detail some of the questions with which we are dealing and to suggest some problems that will want attention, and to show you that this question of conservation is of vital importance to us, not only because of the unfortunate conditions which have been allowed to grow up in Canada already, but more because of the splendid opportunity we have to prevent these conditions from developing in the future. We have a greater responsibility than European nations in that matter because we can, by paying attention to these things now, prevent a great deal of the evils which have grown up in the older countries and which are now insoluble there because they have been allowed to be established. We must begin by recognizing that the rural and urban problems are inter-dependent. You cannot solve civic problems in Ottawa without regard to rural problems surrounding Ottawa, and the problems in the rural territory of Carleton and Russell and the other counties adjacent to the city are affected by conditions in the city. We have to pay regard to the two problems side by side, and to remember that the root of all these civic questions is the housing question and the land question, and that all else we do towards improvement must centre around the question of how we provide shelter for our people and secure legislation to bring about the best economic use of the land, and the best results from the application of human activity to our resources. Work is being done in regard to civic improvement all over the Dominion.

In Nova Scotia there is a Civic Improvement League at work which has done a great deal to secure the passing of legislation, and which at the same time applies itself to improvement work in that province. They have a very good illustration in connection with the planning and development of land in Nova Scotia, which is practically compulsory to the whole province, and they are also proposing to set up there a department of municipal affairs with an expert staff, so that every municipality will have guidance and assistance from the Provincial Government.

In New Brunswick there is in connection with the Board of Trade a housing committee which has made some investigations, and I

would like to show you some of the building in the city of St. John and a town planning scheme which they are carrying out in that city.

In Quebec and Ontario we have a number of Civic Improvement organizations; one in Montreal, a very active one, which is doing a great deal of excellent work similar to what you are doing in Ottawa.

In Ontario, we have, in addition to your League, two active centres at London and Hamilton, where conferences are held every year of all municipalities within a near radius of these two cities. Two very successful conferences were held this year. In Toronto there are a number of organizations, including the Civic Guild and the Housing Association, which are brought together every year in annual conference to deal with civic improvement questions, and that conference is also affiliated with the central body.

At Winnipeg there are three active local organizations which are affiliated with the Dominion League. There is the Citizens' League, the Civic Improvement League, which has invited the next conference to be held in Winnipeg,—and the Town Planning and Housing Association.

In all the other western provinces there are active organizations.

Going back to the east we find in the city of St. John that they are beginning in the right way to deal with their bad housing and sanitary conditions. They are recognizing that you cannot solve the housing problem merely by pulling down the bad buildings erected, and so they started to prepare a proper plan, a scheme for the proper planning of St. John and surrounding country. That scheme is fairly well advanced, and embraces the whole of the area likely to be developed in the next one hundred years, including part of Symonds and Lancaster, outside of St. John. They have included in that scheme more land in the counties outside than in the city, and are preparing a town planning scheme for the whole of that territory without objection from the local authorities. They will determine which shall be the main arteries for the distribution of traffic by road, and lay down the principles on which roads shall be constructed; they will determine the number of houses that may be erected to an acre, and if they determine that aright the erection of crowded buildings on the land will be practically impossible. They have the opportunity to settle where they shall put their isolation hospitals, their asylums, their cemeteries and their public parks, so as to secure the very best results from the proper distribution of these institutions and grounds. The whole question of the future development of the territory will be considered. A town planning scheme, or rather, a development scheme, is not a scheme which is limited to the preparation of a map. It is a scheme determining principles, it is a scheme to determine that the conditions of growth shall be healthy and shall provide for the proper growth of the city in the interests of the health of the people who are going to live in it, and, when we recognize that, we shall see how tremendously important it is to prepare these schemes and to determine these things in advance.

There is not only the new growth outside a city, but the old growth inside the city to consider, and we have a serious problem in Ontario to-day in connection with the conversion of our hotels into tenements and into dwellings without sanitary arrangements. We pay too little attention to surface drainage. One of the most serious causes of disease is due to the surface contamination of the soil outside the homes of the people. We sometimes think that the houses of the workingmen in England look comparatively uninteresting and monotonous; but no home of a workingman in England can be occupied unless it has 150 square feet of good pavement outside the house itself to provide proper surface drainage. It must have, in addition, a proper supply of water in the home before it can be occupied, and must have in all urban districts, connection with the sewerage system of the district.

We need to pay more attention to fire prevention. A great many of the deplorable fires in Quebec and Ontario could be prevented if we insisted on better building construction. In Quebec I saw people reconstructing a building with the same timber frame and the old wood that had caused the deaths of three children three weeks before. We practically refuse to learn in these matters from our experience.

Turning to Ottawa itself, a great deal of what is called civic improvement has been done. But it has been done out of national funds, and, while it has very greatly beautified the city, and while we see a great deal that is very beautiful compared to what it was a few years ago, there is still room for some improvement in what is done by the city itself; and I hope that steps will be taken to try and deal with the situation before the development has gone so far that practically everything that will have to be done will be costly reconstruction. We have a beautiful site for the city, and one who has travelled a great deal must recognize that, for natural beauty, there is probably no city in the world that has better natural advantages than Ottawa. Anything that has been done to injure that beauty has been the result of want of method in its planning and development.

We need better building construction and better housing accommodation in Ottawa. A great deal of the injury to a city is in the second or third stage of development of the land. It is not when the first houses are erected, one on each lot, but when the lot becomes more valuable, and they crowd people on without proper sanitation and as if there was not sufficient land to go around. We seem to be indifferent to the fact that it is possible in Ottawa to provide ample accommodation for our people without unhealthy conditions. Crowded tenements are side by side with vacant lots covered with rubbish. The owners of the vacant lots are paying heavy taxes for vacant land and no one wants it because other land has been overcrowded. In proportion as you overcrowd one site you will leave other sites vacant. In the suburbs, in some of the most desirable districts, you find houses on swampy grounds with garbage dumped three feet deep and the building erected on the top of the garbage. These conditions have to be frankly faced;

there is no use pretending they are right. Even the dumping of the garbage in clean-up weeks is done in a very undesirable way. At the very moment when we are spending hundreds of thousands of dollars to beautify the Rideau canal, we are, by the careless disposal of our garbage, destroying some of the finest spots which we have in our neighbourhood; these, with very little expense, could be made extremely beautiful, while it will cost hundreds of thousands to produce as good effects in their place when the destruction is completed.

The question of planning a city, as I have said, is sometimes regarded as solved if you prepare a plan. The Grand Trunk Pacific Railway company probably spent more money in the preparation of a plan of Prince Rupert than any corporation or government has spent in Canada. They had the whole site cleared of timber; they employed engineers and surveyors to prepare a topographical map; they had every contour level provided for them; they employed landscape architects from the United States to prepare the plan, in conformity with the best principles of planning, and with regard to the physical conditions of the site which the city was to occupy. And yet, if you go to Prince Rupert, you will find exactly the same conditions that you find in any city in Canada with regard to bad housing of the poorer workingmen. That suggests that the mere preparation of a plan really does not carry you very far. After all, the plan does not conserve life; it does not secure for you healthy housing conditions—you must have a development scheme as well as the plan to prevent bad housing conditions and to lay down the principles on which the town shall be built up. The point is Prince Rupert should have had a development scheme as well as a plan in order to control the kind of development that will take place and to prevent these unhealthy housing conditions.

One of the conditions in Canada is that we are having new territory developed by large manufacturers for new towns. One of these is the United States Steel Corporation, which is laying out a new town at Ojibway, near Windsor, Ont. As soon as the Steel Corporation acquired 1,000 acres to build a new town, a number of real estate interests set out to exploit the land all around the site. The Steel Corporation had previously built a town at Gary, Indiana, which was laid out and developed very unsatisfactorily. Provision was made for good as well as wide streets, for proper sanitation and good planning, but all around Gary, on the land not purchased by the corporation, most deplorable conditions have grown up, and the worst kind of houses have been erected. Saloons are standing almost side by side, because there are none permitted in Gary. In other words, it is not sufficient for any corporation, in laying out a new town, to provide for the proper housing of their own people; there must be government direction and control of the new territory in connection with the development, and there must also be control of the development of the surrounding lands.

We will not succeed in securing co-operation for farmers, in providing the social intercourse which they require, in securing the advantages of rural credit and better means of distribution,

unless we plan the land in such a way that they can have village communities in the centre and have proper means for distribution. Men who build their farms in isolated positions miles from each other are not able to co-operate or secure proper educational facilities and make their farms pay because of the absence of these villages. That is a big question intimately connected with the question of returning soldiers, and it has an intimate relation to the question of better roads. We cannot get good roads in Canada because we have too many roads, too much road surface to deal with, and we do not know which to deal with first. We cannot get sufficient concentration of attention on particular roads; every farmer has so much road surface, and is interested in the particular piece connected with his own farm, that it is very difficult under the present system to get improvement.

In laying out streets and roads for residential purposes we ought to try and preserve the trees, and not try to make very wide roads and create artificial beauty at great cost when the beauty destroyed is much more valuable. In some garden villages in England they spend their money on the houses instead of on expensive street construction, and thereby they obtain fine gardens and get much better advantage from the system developed.

HON. SYDNEY FISHER: I am sure you have had, as I have, a great treat in listening to Mr. Adams in this address. He has given us many thoughts which go home, and has suggested what we can do in the way of civic improvement. I see we have with us Dr. Adami, from Montreal, who has taken the lead in civic improvement and such matters in that city. Perhaps he would say a few words of greeting if nothing more.

DR. ADAMI: As the first president of what I believe was the pioneer Civic Improvement League in Canada, it was a great pleasure to me, when stealthily creeping into this room, to hear the speaker mentioning the Montreal Civic Improvement League. We started that many years ago, and began under considerable difficulties. But year by year, I feel that that Improvement League has had influence, and is having influence, not merely in Montreal alone but throughout Canada, until now we have Leagues in many cities throughout the Dominion. I am reminded of a statement made to me long years ago by one of the leading editors of a very important journal in the United States, a man who is progressive and who was unburdening his soul when he said to me: "You know, really, our work as editors is not perhaps wholly satisfactory to our self esteem. I, for example, have an idea with regard to some improvement, and I write a leading article on that subject. Nobody seems to notice it. I wait two or three weeks and write another article. Nobody ever mentions it to me. But I still keep up my heart, I am not disappointed. Perhaps a month afterwards I write another article on the subject, and then within the year a fifth article. And then suddenly everybody begins to talk to me about it. Men will come to me and say: 'I am glad to see that article, but I have always been thinking of it, I have always had it in mind, and I heartily agree.' Those men do not remember that practically it

has been due to the line-by-line instilling of the thought." So we have been working and talking and talking, and eventually we get the nation and the people to take up our ideas. It is so with regard to civic improvement.

We are getting the idea into the people that the life of the citizen must be rendered healthier, happier and brighter, and that this can be accomplished by such simple methods—methods as those explained at the end of the lecture to-night—by consideration of cost and of laying out and planning to give more fresh air and sunlight and happiness to our people. We will have after this war, I think, a simpler condition of affairs in Canada. We will have our years of difficulty and years in which we will find that, as money is not made so easily, people will begin to get more anxious, more thoughtful, about the way they spend their money. After this wave of great prosperity of the last few years, with these changed conditions, we will get the ordinary man to consider how he can live best, and with this idea in our minds there will be a gradual tendency towards simpler and better conditions of living, and the root idea of all Civic Improvement Leagues will be developed.

DR. P. H. BRYCE: As a member of the Local Improvement League and the Civic Improvement League of Canada it has given me great pleasure to be able to observe, in a recent trip through the West, as well as in parts of Ontario, how active the interest in this whole work of civic development and civic planning is becoming. The very fact which you set forth to-night, with regard to the subjects taken up by the newly-formed local league, are a very good indication of the direction in which public thought and action was moving toward the fulfillment of ideas in concrete fashion.

HON. SYDNEY FISHER: I sympathize very much with what Dr. Adams and Dr. Bryce have said, that it is only by hammering and hammering through a long period of years that you can really make an impression. It is wonderful what a few years of hammering will do, and I have no doubt that a few more years of hammering on this question of civic improvement will show a vast result, far greater, perhaps, than at the present moment appears likely.

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